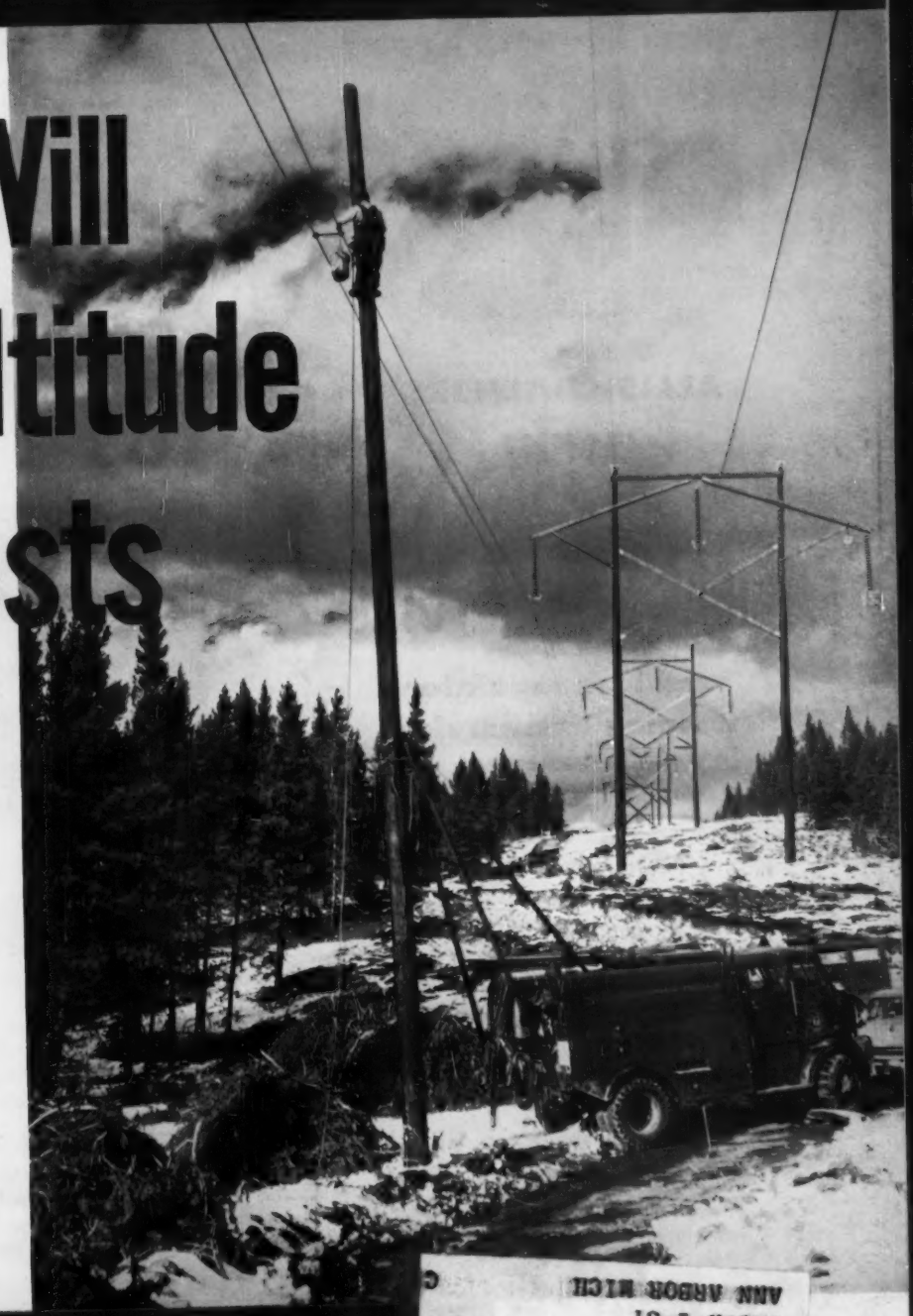
Electrical World

What Will High Altitude EHV Tests Show?

...Page 51



E B POWER
UNIVERSITY MICROFILMS IN
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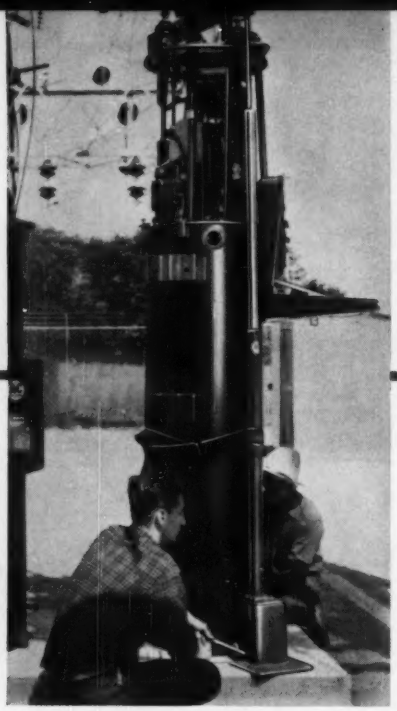
ANN ARBOR MICH

NEW! Perforated pages for easy filing
Both yellow sections, news, features



Convenient, easy-to-use hydraulic untanking jacks are available to all Allis-Chalmers regulator users.

Mobile unit carries all needed tools and repair parts. Oil storage tank, filter press and dielectric oil tester are in trailer.

ALLIS-CHALMERS

NEW Field Service Unit

combines regulator training and service

Mobile service unit brings trained service personnel and instruction on preventive maintenance to regulator site.

THIS mobile unit has proved to a growing list of utilities the economy of preventive maintenance on a planned program.

Utilities are encouraged to have their own men participate for training.

The service includes detailed inspection of mechanism, checking band width, voltage level, and relay contacts, retouching paint, replacing parts and filtering oil if necessary . . . thus extending regulator life . . . eliminating potential troubles.

All service, whether for single or three-phase regulators, is done at the regulator site. Full advantage is taken of *unit construction* of Allis-Chalmers regulators. Downtime is reduced.

See New Movie

Additional information in colored 16-mm sound film can be obtained by contacting your nearest A-C office or writing Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

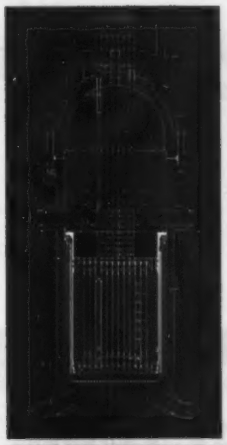
A-5584

Electrical World

Vol. 149, No. 3 JANUARY 20, 1958

Published for 84 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue



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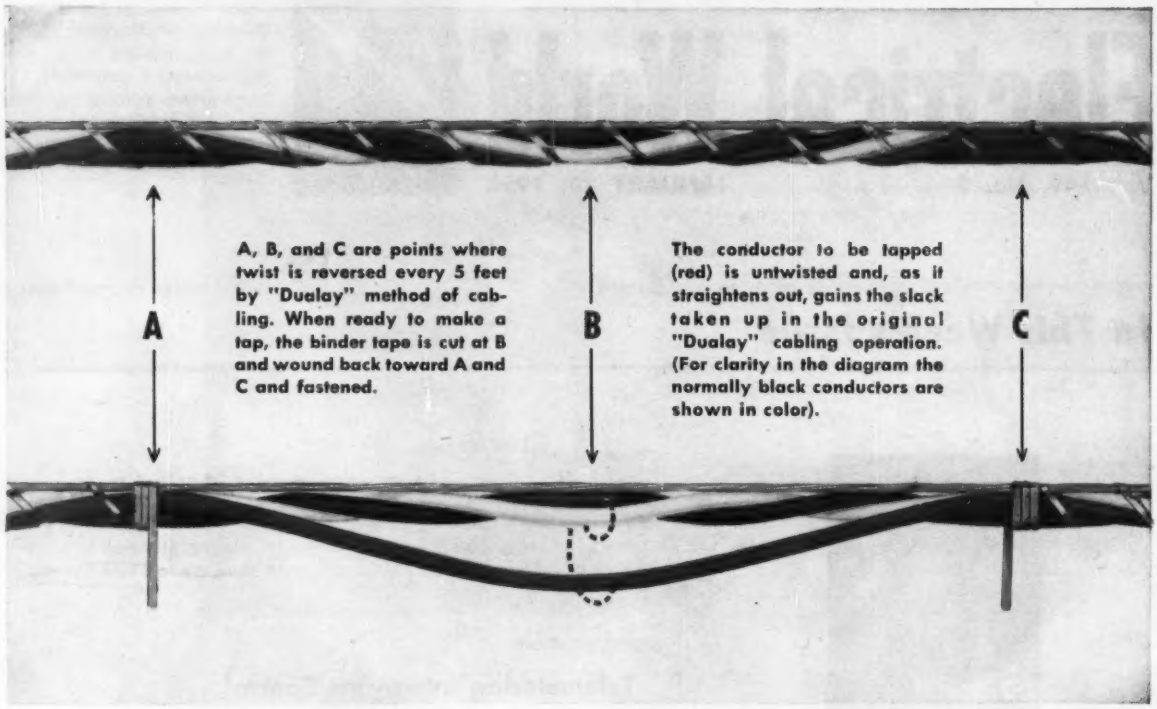
A
B
C
A, B, and C are points where twist is reversed every 5 feet by "Dualay" method of cabling. When ready to make a tap, the binder tape is cut at B and wound back toward A and C and fastened.
The conductor to be tapped (red) is untwisted and, as it straightens out, gains the slack taken up in the original "Dualay" cabling operation. (For clarity in the diagram the normally black conductors are shown in color).

how DUALAY* further reduces cost of self-supporting aerial cable

Most public utilities are fully aware of the economies of self-supporting aerial cable distribution systems. Savings are realized through ease of installation, reduction in tree trimming, fewer service interruptions, use of longer spans, and lower maintenance costs.

However, the DUALAY* assembly, originally developed by Okonite engineers and now a standard construction on all 3/c Okonite self-supporting cables up to 15kv, offers still further installation and maintenance economies.

Main feature of the Dualay assembly is that the direction of lay of conductors is reversed at regular short intervals. This permits unshielded cables to be tapped hot. (See diagram above.) The phases can be separated without cutting the copper or aluminum conductors and without performing any operation on the messenger. Design permits use of wire guards and rubber blankets for safety, and linemen can open up cable for tapping at a pole without use of a platform. Dualay assembly also prevents longitudinal or tension stress on the conductors and assures strain-free conductor splices.

Dualay assembly is available with either Okolite-Okoprene construction (strip-insulated type) or Keystone-Okoprene (extruded type). Bulletins are available on each. The Okonite Company, Passaic, N. J.

4347-A

available with either copper or aluminum conductors

***where there's electrical power . . . there's* OKONITE CABLE**

*U. S. Pat. No. 2,430,378

The Regulatory Climate

"A recent computation shows that in 1956 our property was valued for ad valorem and franchise taxes by the various political units of the state at a figure substantially in excess of its net book cost or original cost. Yet the Public Service Commission says it should use only original cost in setting rates." This comment was made by Keith S. McHugh, president, New York Telephone Co before a group of Syracuse business men.

Mr. McHugh also made some other startling statements concerning the way his company was being treated by the Public Service Commission. He said, "We have had no retained earnings in the last 15 years" and "our rate of earnings to capital invested has been lower on the average over the past ten years than during the four worst years of the great depression."

As McHugh pointed out in his talk, the New York Telephone Co has apparently "ridden on the coattails of the (Bell) System's credit."

These statements are startling. But one thing is certain. The customer has not suffered. And apparently the people in New York State have the Bell System to thank for that.

Fischer Black

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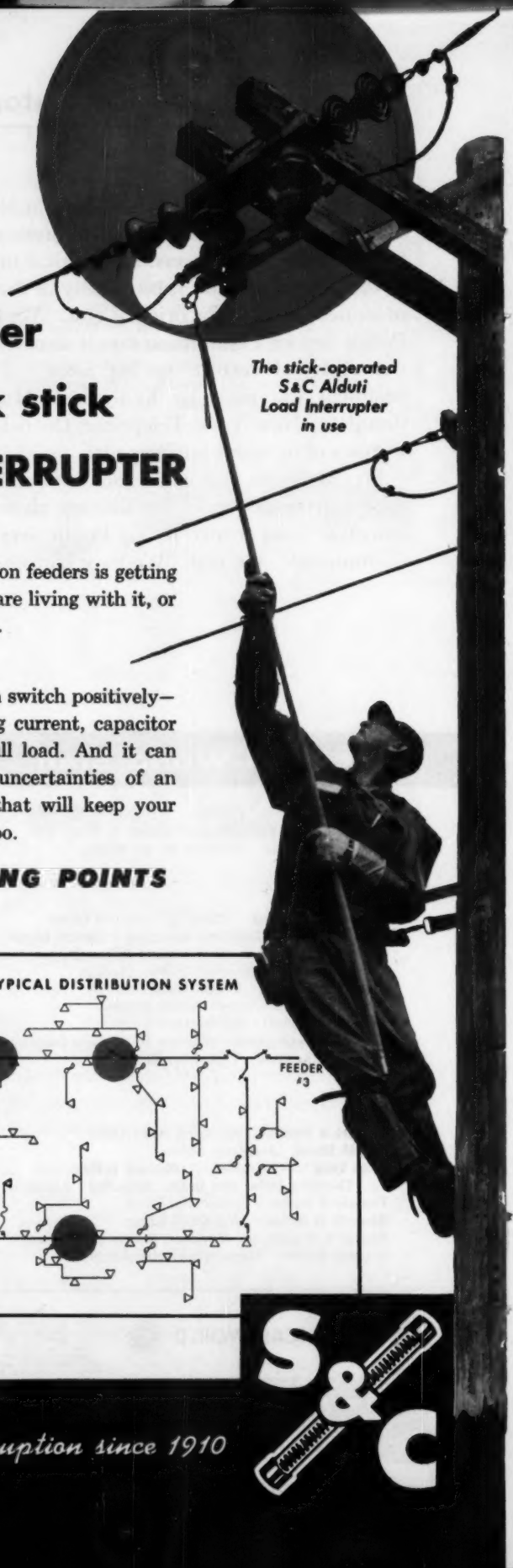
he can switch your 12 kv feeders anywhere, any time, under any load with a hook stick using an S&C LOAD INTERRUPTER



The stick-operated S&C Alduti Load Interrupter in use

Sure! The switching of your 12 kv distribution feeders is getting tougher and tougher! Maybe your linemen are living with it, or maybe you are spending a fortune just to get by.

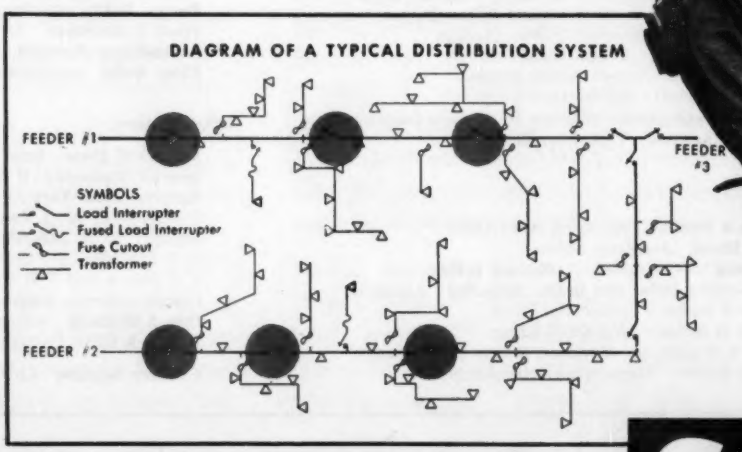
Is there another alternative?

Certainly! A stick-operated S&C Load Interrupter. It can switch positively—under any condition—any load, whether it's line charging current, capacitor charging current, magnetizing current, or full load. And it can be done without the hazards and uncertainties of an external arc. Here's a switch that will keep your linemen happy, and the comptroller, too.

USE IT AT SECTIONALIZING POINTS

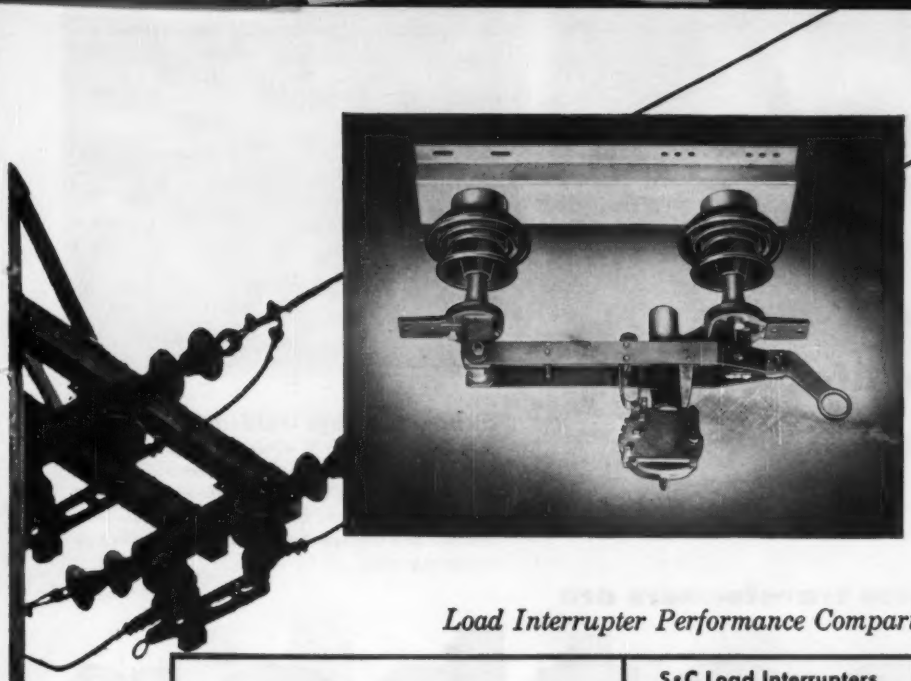
On 12 kv *radial* circuits, increased loads have made switching at sectionalizing points virtually impossible with conventional disconnects. On *loop* circuits (right) it's difficult enough where the duty involves only switching in parallel. And if the tie switches are open, hazard-free circuit interruption can be an impossibility.

Here, S&C Load Interrupters will give you safe, positive, circuit interruption on full line voltage and full load current—an advantage under emergency conditions, and a convenience under normal circumstances.



Specialists in High-Voltage Circuit Interruption since 1910

S&C



The S&C Load Interrupter, Alduti type; outdoor, single pole, (stick-operated); 14.4 kv, 600 amp. Three-pole, group-operated load interrupters are also available.

Load Interrupter Performance Comparison

PERFORMANCE	S&C Load Interrupters		Conventional Disconnects	
	Stick-Operated	Group-Operated	Stick-Operated	Group-Operated
Interrupt current from parallel sources safely?	YES	YES	DOUBTFUL	DOUBTFUL
Safe to equipment or personnel if inadvertently opened on full voltage (in case loop is open)?	YES	YES	NO	DOUBTFUL
Dump load without opening feeder breaker, or without preliminary unloading?	YES	YES	NO	DOUBTFUL
Multi-pole device controllable from ground (may be required by system practice or other circuits on same pole)?	NO	YES	NO	YES
Interrupt line charging current safely?	YES	YES	NO	DOUBTFUL
Cost?	LOW	HIGHEST	LOWEST	HIGH

The S&C Load Interrupter can switch the circuit without unloading preliminaries and without opening the breakers. The use of S&C Load Interrupters cannot lead to dangerous phase-to-phase or phase-to-ground faults, because there is NO EXTERNAL ARC. Also there is no danger to men or equipment in case of inadvertent operation. The S&C Load Interrupter breaks all load and charging currents instantly and decisively. Besides, you can mount it in any desired position —vertical, upright, or inverted. Write today for Catalog Section 760 on S&C Load Interrupters.

LOAD INTERRUPTERS

S&C ELECTRIC COMPANY

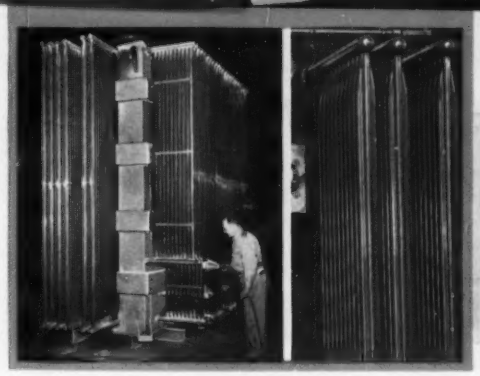
...Attention to **CONSTRUCTION** detail adds years to transformer life... reduces maintenance

Submerged arc welding machine welds tank sections together in a smooth, liquid-tight seam. In other welding operations, giant "mechanical hands" position tank so arc welding is performed downhand for maximum strength. Size of fillets, exact locations, electrode and heat specifications are all determined by design engineers.

ALLIS-CHALMERS power transformers are

weather

A-5516



Welded-on radiators save time and money by simplifying installation. After welding is completed, transformer is sealed and pressure tested under extreme conditions. Fewer parts reduce maintenance. Nooks and corners where dirt and corrosion get in their destructive licks are eliminated.

Perfect seal provided by gasketing method for bolted cover. Gasket seat is accurately formed to confine the cork Neoprene gasket and control its compression. Welded cover is also available. Domed cover sheds water, to lengthen life of protective paint.

-tight

Balanced Design means

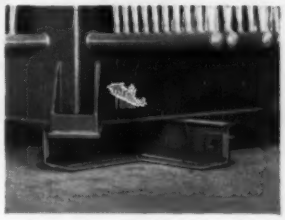
MORE for your Transformer Dollar

Weather-tight construction is another of the many features that make up the balanced design of Allis-Chalmers power transformers . . . features such as corona-free design, high impulse strength, uniform cooling, high short-circuit strength, reduced size and weight and many, many other features.

With power demands continually increasing, it is more important than ever to get assurance of dependability and long transformer life. For all the facts, call your nearby Allis-Chalmers office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

Check these conveniences too!



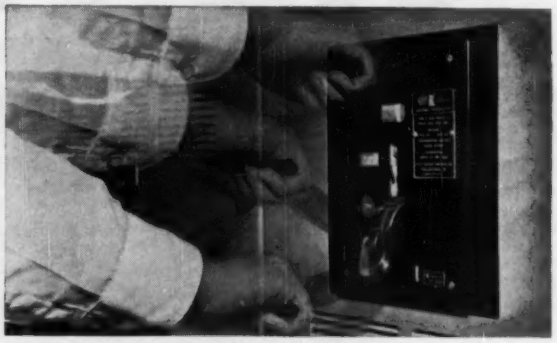
Ample jacking space makes installation quick and easy. Practically any type jack may be used.

Ski-shaped base of heavy I-beam cross supports makes it possible to skid transformer in any direction.

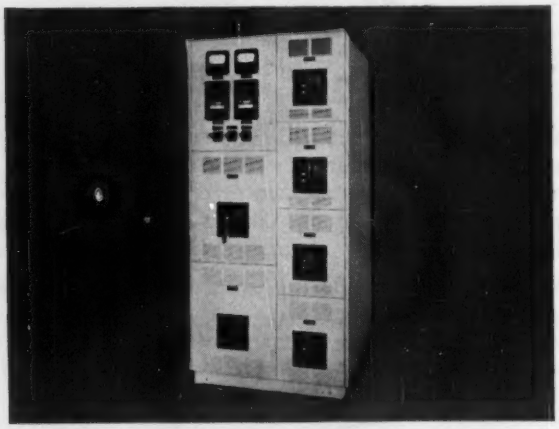
I-T-E makes sweeping design advances in new low voltage power circuit breakers, switchgear

I-T-E's new K-Line offers better performance, greatly simplified operation and servicing, and standardization in construction and assembly

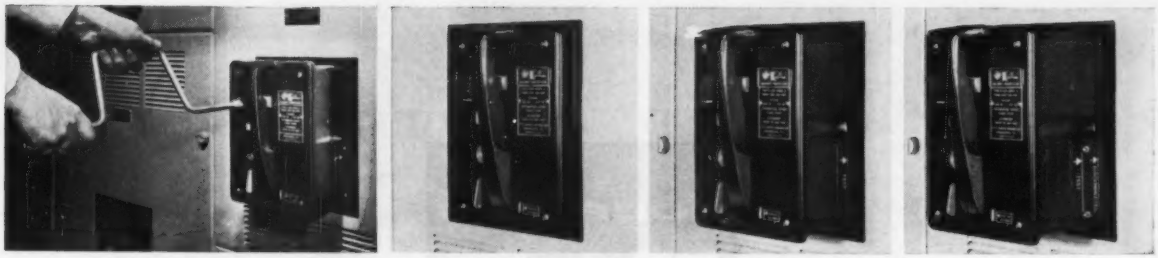
Now we offer a complete new design of equipment for the switching, control and protection of motor, generator, transformer and feeder circuits, as well as other large electrically powered facilities—the most sweeping design advance in 13 years. Among the major innovations in the new design are the following.



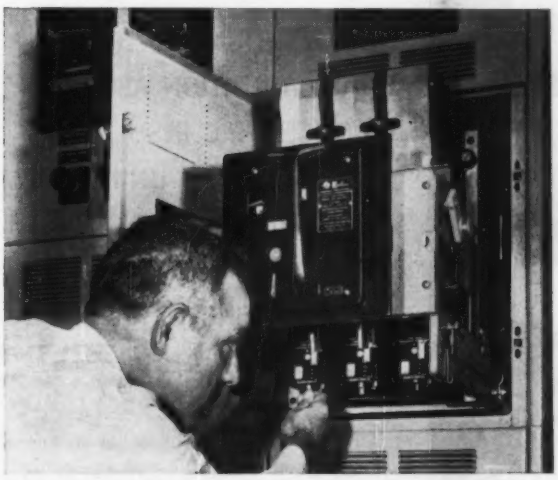
First quick-make manually charged stored energy closing mechanism. First 90% of pulldown handle travel charges spring mechanism, last 10% releases stored energy, automatically closes contacts. No teasing of contacts is possible.



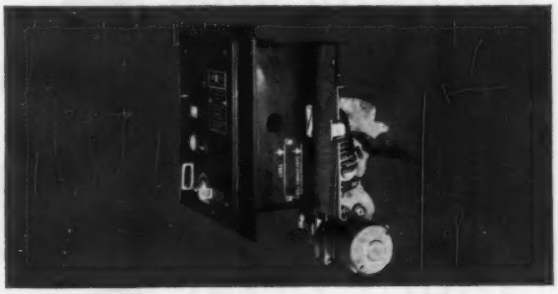
4-high stacking of 600 amp frame size circuit breakers in 90-in.-high enclosures. The new circuit breakers are as much as one-third smaller and 55% lighter than comparable units. The new switchgear is the smallest ever designed.



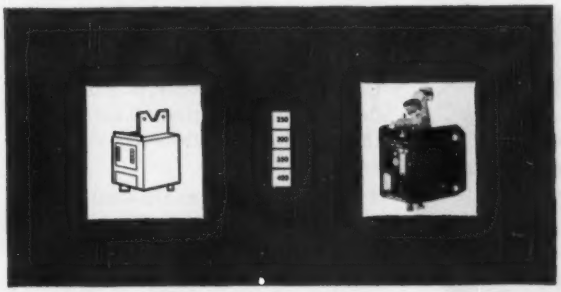
First closed-door drawout of circuit breakers. This permits racking of circuit breaker into connected, test and disconnected positions without opening the door of the circuit breaker compartment. Drawout arrangement keeps circuit breakers clean, aisles uncluttered, promotes personnel safety. Breaker must be opened before shutter can be lifted to insert drawout racking crank. Breaker cannot be closed while shutter is lifted.



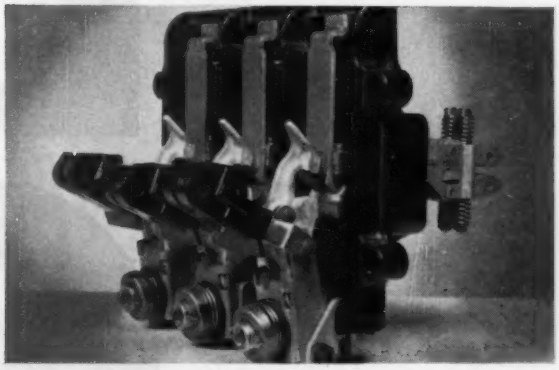
Greatly increased accessibility to component parts for operation and servicing. For example, trips on electrically and manually operated breakers are out in the open and can be easily adjusted. Trips also can be changed quickly. One-piece molding holds trip units, which are changed from the rear and in a fraction of the time formerly required.



Stored energy electrical closure that materially cuts control circuit requirements. The motor-driven stored energy system requires only 10 amp from a simple power source, compared to as much as 160 by comparable solenoids. Quick-make manual closure operates on same principle. First 90% of pull-down handle travel charges a spring mechanism. Last 10% releases the stored energy and closes the contacts. No teasing.



Expanded trip flexibility meets last-minute load changes in many instances with the existing trip unit.



Subassembly circuit breaker construction permits easier, faster replacement of parts. Six major subassemblies replace 130 separate parts in previous models. A part replacement formerly requiring an all-day overhaul of the circuit breaker may mean only removing and replacing a unit subassembly—a matter of minutes.

Bulletin 6004C tells the complete story of this advanced design switchgear. Ask your local I-T-E representative for a copy today. Or write I-T-E CIRCUIT BREAKER COMPANY, Switchgear Division, 19th & Hamilton Sts., Philadelphia 30, Pa.

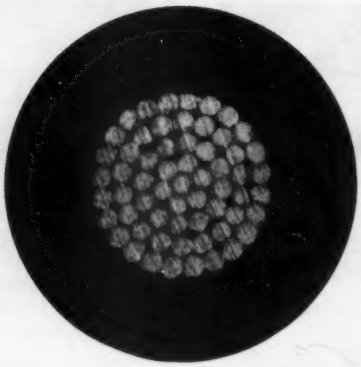
I-T-E CIRCUIT BREAKER COMPANY

19TH AND HAMILTON STREETS, PHILADELPHIA 30, PENNSYLVANIA

The radically new, better way to make 15 KV BUTYL-INSULATED CABLE!

ROEBLING

VCV



NEW **V**ERTICAL **C**ONTINUOUS **V**ULCANIZATION ASSURES CONCENTRIC INSULATION. THE RESULT IS UNIFORMLY HIGH DIELECTRIC STRENGTH AND IMPROVED CORONA LEVEL—THROUGHOUT THE LENGTH OF THE CABLE!

Unlike cable cured by other means, butyl-insulated high-voltage cable produced by Roebling's new Vertical Continuous Vulcanization method is never eccentric, abraided, flattened, scored, and its diameter never varies. Conductor is centered *through every inch of the cable.* What's more, the butyl insulation, even in "thick-wall" cables, is dense, free from internal blisters because every foot is cured at the same temperature and pressure. Controlled concentricity, plus uniform dense insulation, gives these cables their exceptional dielectric strength and corona level.

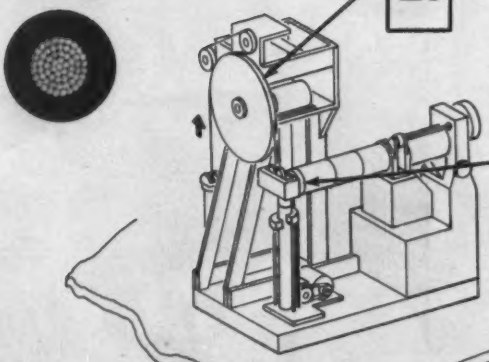
This is superior cable—we don't know how else to say it. For complete information write Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING VCV 15KV CABLES are available in a complete range of strand constructions and insulation thicknesses—and with shielding, sheathing and other specifications that exactly meet your requirements.

ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

Here's how ROEBLING VCV *works!*



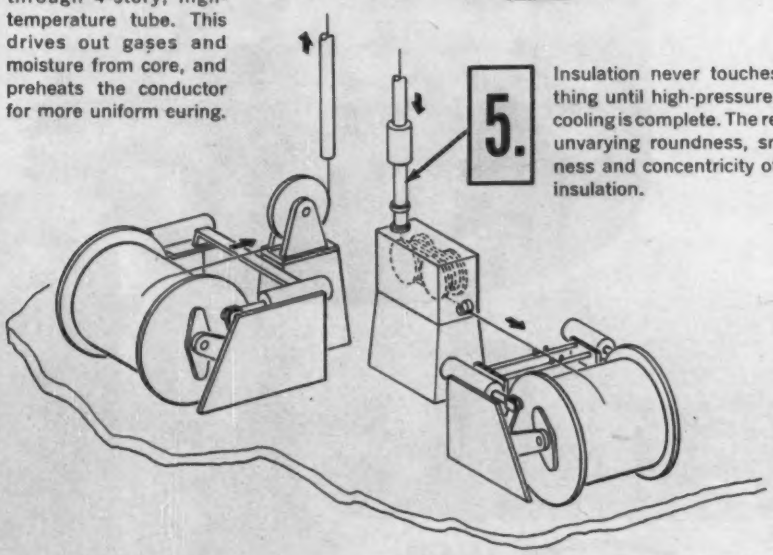
2. Conductor is put under controlled tension, which is maintained during entire insulating process.

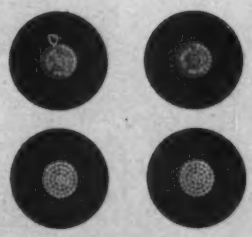
3. Butyl insulation is extruded downward around conductor.

4. Vulcanization takes place continuously and uniformly in vertical tube. Constant high steam pressure assures dense, sound insulation.

1. Strand wrapped in semi-conducting tape goes up through 4-story, high-temperature tube. This drives out gases and moisture from core, and preheats the conductor for more uniform curing.

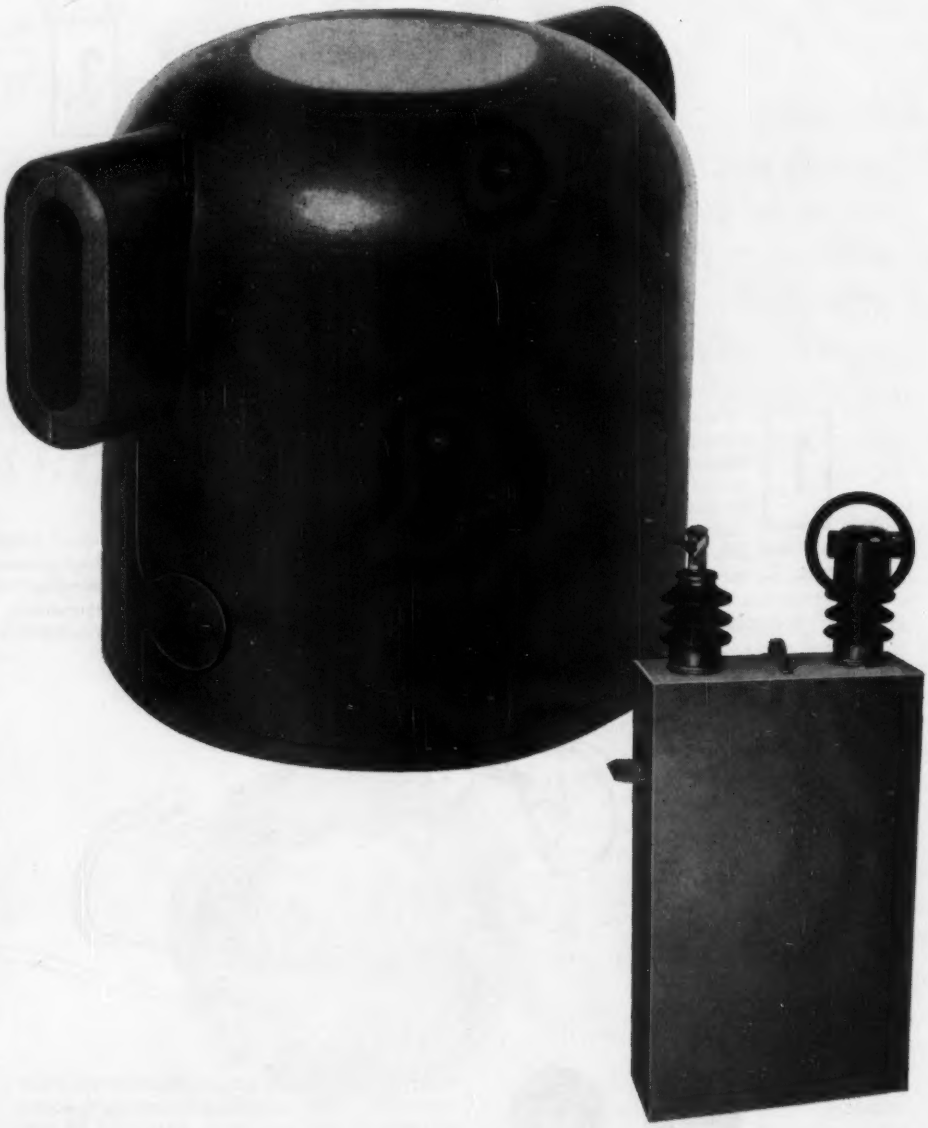
5. Insulation never touches anything until high-pressure water cooling is complete. The result is unvarying roundness, smoothness and concentricity of butyl insulation.





These samples from a single conductor, 500 MCM cable with 42/64 insulation produced by Roebling VCV method were cut (left to right) at 10, 50, 500 and 1000 ft. intervals. Note how all sections have identical diameter and concentricity. Impartial utilities' experts who examined these samples say they've never seen anything to compare with them for uniformity, roundness, concentricity, smoothness and density of insulation.

Capacitor prog



ress starts with TOBE

TOBE ENGINEERS KNOW that progress means not only monumental changes, but small improvements that can make a big difference in the daily operation of a utility. For example: look at the self-locking rubber insulator cap on the left! Small—but did you ever try to tape a connector while hanging from a safety belt? It's time-consuming and none too safe to say the least. But with this TOBE insulator*, slap it over the connector, pull it together: presto you have a safe, enduring shield, (exceedingly simple to take apart).

TOBE TEMPALL CAPACITORS *also feature:*

- Special clamp arrangement with vibration-proof nylon-insert stop-nut on line hardware;
- Stainless steel case, at no extra cost;
- Losses consistently lower than requirements;
- Factory engineering field supervision;
- Individual control of every capacitor during assembly and impregnation;
- Discharge resistors across each series group;
- Because of low losses resulting from TOBE's design and manufacturing technique you get more correction for your dollar.

That's why it pays to investigate TOBE capacitors today. Available in all standard ratings: in single units, racks, pole assemblies and complete cabinets. Write to Tobe Deutschmann Corporation, Norwood, Mass., or phone Norwood 7-2620, collect for further information today.

LOOK TO TOBE FOR PROGRESS

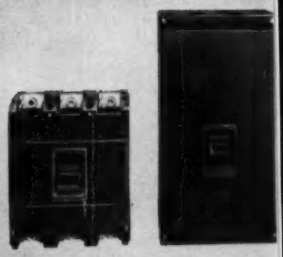
TOBE

TEMPALL CAPACITORS

*PATENT PENDING

Since 1929 persistent research, trustworthy engineering, rigid production standards.

NOW Federal Pacific's "Giant"



⅓ Smaller Than Ordinary NKL's—yet does every thing the 400 amp. NKL does! Speeds installation... simplifies inventory...provides greater flexibility. Cost? Actually less than regular NKL breakers!

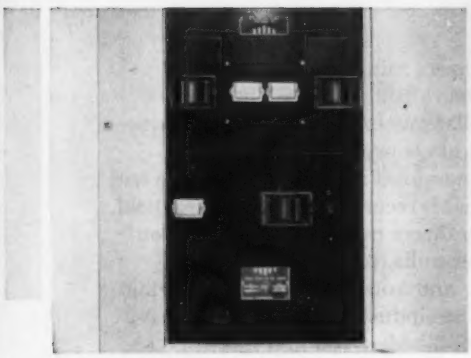
AB Breaker Development Program brings you...

The Remarkable NJ-400

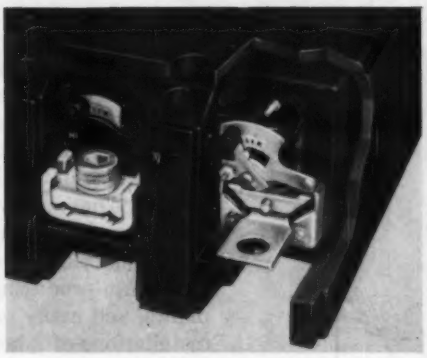
...the most compact 400 amp. breaker ever produced!

From the biggest AB Breaker development program in the industry—comes a steady stream of new advances. First, Federal Pacific introduced the revolutionary 11/16" wide single-pole "NE-W" breaker! Then came the convenient, cost-saving 480 v. "NE-F"! Now, Federal Pacific does it again...offers you a brand new breaker development that transcends all the others—the NJ-400!

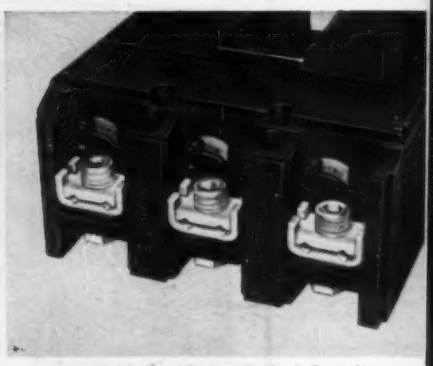
Remarkable for the compactness of its design, the new "NJ-400" permits double the number of 400 amp. circuits in a given panelboard or switchboard...allows use of smaller AB-I enclosures. Approved by Underwriters' Laboratories, the NJ-400 is the most compact, heavy-duty 400 ampere circuit breaker on the market today! Available in 2- and 3-pole current ratings of 70 through 400 amperes.



Added Flexibility! Now you can install two 400 amp. breakers in the same space ordinarily required for one...you double the number of 400 amp. circuits in panelboards and switchboards.



New Adjustable Magnetic Trip! Conveniently located...completely adjustable over a wide range of current values, this new magnetic trip protects various motor starting inrushes.



Remarkable Double Lug Design! In spite of its compact size, the new NJ-400 features double lug design which permits additional conductor current carrying capacity wherever necessary.

For complete details, write:

Federal Pacific Electric Company, 50 Paris Street, Newark 1, N. J.

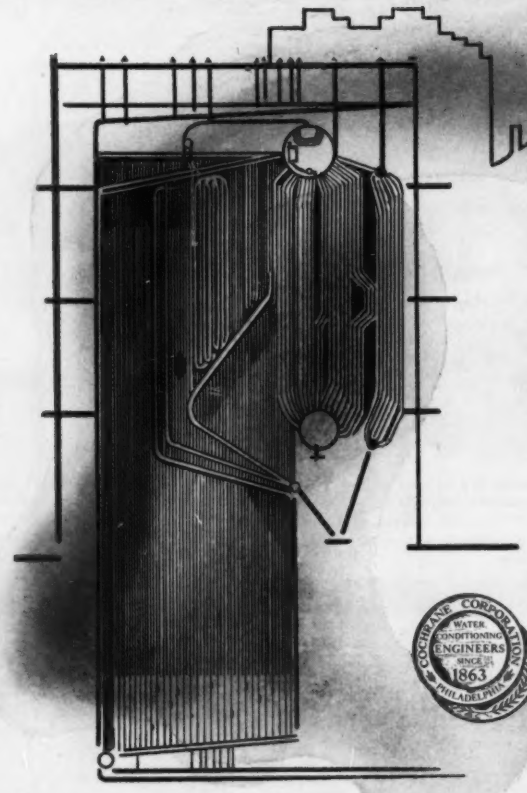
FEDERAL FPE PACIFIC

Better Products to Control Electricity

COCHRANE . . . FIRST IN WATER CONDITIONING

SILICA and SOLIDS

Reduction



Cochrane Demineralizers safeguard your turbine blades and high pressure boiler tubes. Their record of outstanding installations in scores of high pressure steam generating plants is proof of performance. The quality of demineralized water is superlative and Cochrane has an enviable record of progress in this field.

Cochrane Demineralizers now provide protection in oil refineries, paper mills, textile, chemical, aluminum producing and automobile manufacturing plants, and many other industries. These impressive installations of 2-bed, 3-bed, 4-bed and mixed-bed Demineralizers assure continuous, effective protection.

Why not check some of these installations (the list is available) then buy Cochrane Demineralizers for your new plant. Ask for Bulletin 5800-B.

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Representatives in 30 principal cities in U.S.; Paris, France; La Spezia, Italy; Mexico City, Mexico; Havana, Cuba; Caracas, Venezuela; San Juan, Puerto Rico; Honolulu, Hawaii; Manila, Philippine Islands.
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The News-Scope

LATE NEWS ▶ **Future gas inroads into the electric refrigerator field** may result from Whirlpool's purchase of facilities and patents for Servel's gas refrigerator. Whirlpool's aim: to "balance and complement the present line of Whirlpool electric appliances . . ."

Southwest Atomic Energy Associates signs $5.4-million research-development pact with Atomics International Div., North American Aviation. Purpose: To study advanced epithermal thorium reactor.

Plans for an eight-year, $160.7-million expansion are completed by Impulsora de Empresas Electricas, American & Foreign Power's Mexican subsidiary. It replaces 1955's five-year, $40-million plan, revised to keep up with Mexico's rapid industrialization.

Illinois Power asks the state Commerce Commission for an annual $4,344,000 rate boost.

Dayton P&L will supply near-by Wright-Patterson Air Force Base with electricity under a new ten-year pact approved by PUC.

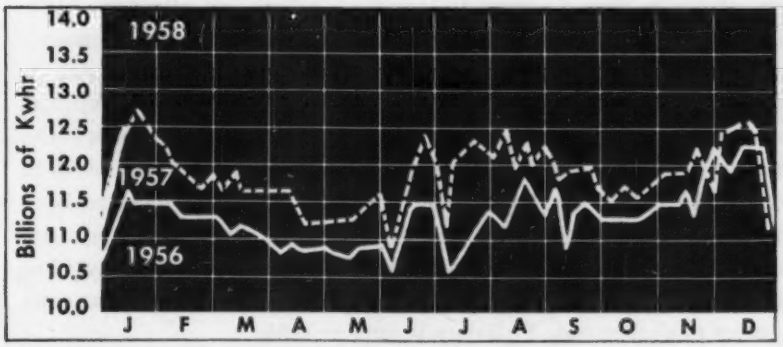
Oklahoma Supreme Court upholds a power-exchange contract between Grand River Dam Authority and Public Service of Oklahoma. Gov Raymond Gary sees chance of GRDA starting on Markham Ferry Dam.

Management promotions . . . New Yankee Atomic Electric VP's are T. G. Dignan and H. J. Cadwell . . . A. D. Barney is board chairman and R. A. Gibson president of Hartford Electric Light.

FUTURE NEWS ▶ **Look for an announcement indicating that Shippingport** nuclear reactor has exceeded its design expectations.

AEC may get a new chairman when Adm Lewis Strauss' present term expires mid-year.

Power Output—Up 1.5% (Week ending Jan. 11), Kwhr 12,506,000,000



Per Cent Change From Previous Year	Dec. 28	Jan. 4	Jan. 11
Total U. S.	+0.2	+0.2	+1.5
New Eng.	+0.1	−2.9	−0.1
Mid. Atlan.	−0.1	−1.3	+0.3
Cent. Ind.	−2.5	−2.5	−2.1
West Cent.	+1.7	+3.7	+0.4
Southeast	−1.0	+2.0	+6.4
South Cent.	+7.3	+5.5	+3.9
Rocky Mount.	+4.7	+3.8	+5.0
Pacific			
NW	−1.6	−1.8	−1.5
SW	+5.6	+0.9	+2.1

Seasonally Adjusted Index 230.3

Week Ago 228.0 Year Ago 226.8

Atomic Energy Commission requirements—1,050,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 2.5%

The Electrical Week

ATOMIC PROGRESS ▶ **A radical change in our national atomic-development policy is** needed. Atoms for peace is part of U.S. foreign policy, whether we like it or not, so America must develop atomic power vigorously. But pursuit of our present nuclear-development policy implies further socialization of the industry. C. H. Whitmore, president of Iowa-Illinois Gas & Electric, offers here a plan which would enable utilities to develop atom power economically as an effective instrument of foreign policy — but without the menace of socialism that would be present if the government develops atomic power under the preference philosophy (p 42).

WASHINGTON ▶ **Sputnik's implications hit federal power programs** in Ike's fiscal 1959 budget. The President proposes no new starts for Reclamation or Corps of Engineers, recommends that federal credit programs charge "adequate" interest rates for loans, and that private financing be used where possible. Under the budget, REA would get $150 million which, with carryovers, would give it $175 million in available loan funds in 1959 compared with $323 million in '58. Administration also plans to introduce a bill proposing issuance of $125 million in bonds for TVA construction (p 40).

EVENTS ▶ **American Public Power Assn lashes out at Guaranty Trust** Co of N. Y. for an ad attacking federal power (p 41) . . . EW interviews Mark Cresap, president of Westinghouse, on future of utility industry, research, Westinghouse's new management team, and effect of the new organization on design and production of electric equipment (p 46).

SYSTEM ENGINEERING ▶ **Western Massachusetts Electric reveals its generation** and transmission expansion program which will maintain its status as a power-exporting company, and back up its service to major load centers. This program ultimately will reach $100 million as distribution capacity is built up to match generation and transmission (p 60).

GENERATION ▶ **Three of six units now are working at Ontario Hydro's** Sir Adam Beck pumped-storage project below Niagara Falls. This project proved more attractive than a thermal plant for peaking capacity. Available land limited a man-made reservoir to 750 acres, with an economic head of 40 to 80 ft and a 25-ft drawdown. Started across the line as motors, the machines can be operated automatically at maximum discharge, efficiency, or power, or constant discharge or power—the last two applying only to the generating cycle. This is achieved in part by adjustment of the turbine blades to a pitch calculated by a computer. At night, the 46,500-hp units will be able to fill the reservoir in 7½ hr. Plant capacity will be 170 Mw at full reservoir, but under normal conditions its output is expected to be 105 Mw at time of system peak demand. Full details start on p 56.

TRANSMISSION ▶ **Tests on EHV power transmission at high altitudes** now are being conducted high in the Rockies by Public Service Co of Colorado, which foresees the day when power may come into Denver from across the Great Divide. The tests will run for about two years. PS engineers are seeking data on corona loss, radio interference, switching surges, mechanics of various structure types, conductor spacers, and high-country transmission construction and operation. Here's a status report which describes the test arrangements, complete with problems that have arisen to date (p 51).

COMMUNICATIONS ▶ **Even though two of its five power interchange substations** are unattended, Interstate Power Co has managed to integrate its automatic load-frequency control system with two neighboring utilities. It has accomplished this by telemetering power in or out-flow over existing carrier-current channels. Requiring no extra carrier equipment, the arrangement gives the dispatcher's office an hourly reading, and enables the power interchange to be figured to an accuracy of 0.1 Mw every hour (p 62).

NEW EQUIPMENT ▶ **A 45,000-lb crane,** through a gas engine-generator-electric motor combination, can be controlled precisely . . . Fault indicator helps spot trouble on 22 to 110-kv lines . . . Rubber insulator hoods fit all pin-type insulators up to Class 5 . . . Dry-type transformers have aluminum conductors and buswork . . . Single-phase power regulator has transformer and tap-changing mechanism suspended from cover (p 80).

SELLING ▶ **A professional Hollywood-type film,** available to utilities, has been made by Westinghouse to boost Housepower . . . Iowa PS uses portable display to push Housepower and Live Better Electrically (p 72).

INDUSTRIAL ▶ **A "home-made" 388-kw car-bottom furnace** has been created to stress-relieve pressure vessels of water and fire-tube boilers. It shaves three to five days off production time (p 78).

FINANCE ▶ **With 1958 foreseen as another big year for utility financing,** it is pleasant to note that yields on '58 issues should be lower than in '57. One expert predicts an interest-rate decline of more than ¼% per year on outstanding Moody's Aaa bonds. Other predictions: An improved bond market, a reduction in reserve requirements, and another cut in discount rate (p 89).

ALUMINUM ▶ **Aluminum producers are banking on the fact** that the metal's future is bright. Future demand is expected to skyrocket, but not right away. Prices probably will remain stable this year (p 87).

PEOPLE ▶ **Oklahoma Gas & Electric** names Herbert L. Branan vp . . . Ebasco Services Inc appoints Robert E. Pierce chief consultant (p 100).

Bids for complex control systems, such as data computing equipment, can be difficult to evaluate. A 12-to-1 spread in costs is not uncommon. In evaluating such bids it is well to remember that they may not be based on the same system concept and reliability, and may not be for the same quality hardware. And bonus features sometimes justify higher costs.—**Control Engineering, Dec 1957.**

Trend among electric cooperatives is toward merging self-services rather than actual mergers of co-ops themselves. This is already being done by building generation and transmission co-ops. Trend is dictated by increasing costs of performing services individually.—**Rural Electrification Magazine, Nov 1957.**

A change in voltage from 1,500 v dc to 25 kv ac at 50 cps is contemplated for Great Britain's proposed electrification of 1,210 miles of main-line and suburban railways. Direct current motors will be used on trains with conversion from ac to dc performed on the train. To avoid construction alterations under bridges and in tunnels voltage will be automatically reduced to 6.25 kv. Taps on the locomotive transformer will compensate for the change without varying the voltage applied to the driving motors or slowing down trains. — **Electrical Review, Nov 29, 1957.**

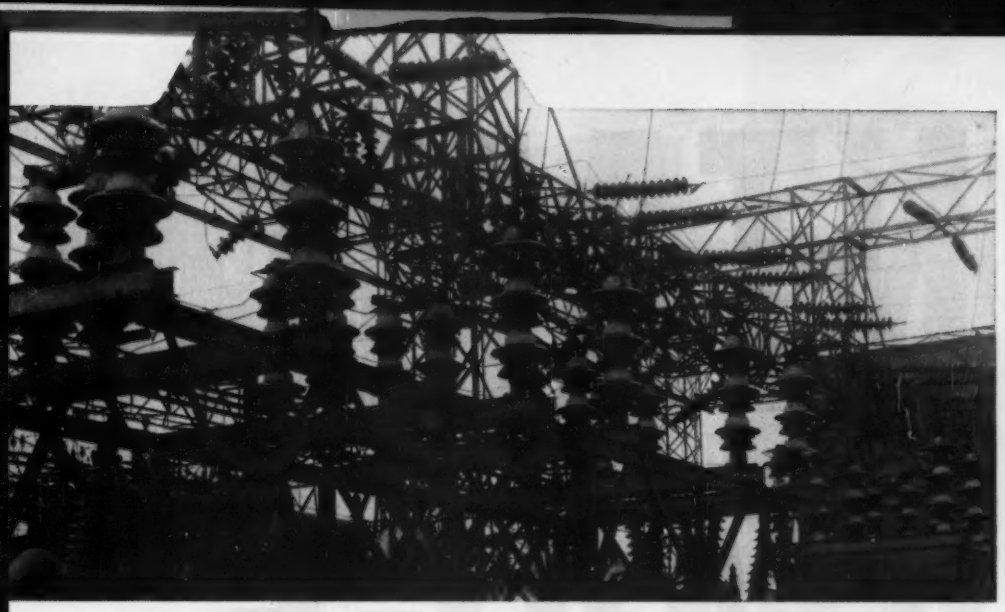
Noise, apart from its auditory effect, can cause annoyance, fatigue, and neglect of work, in an effort to concentrate on heard speech. But tests in which subjects carried out various jobs needing skill and judgment showed that efficiency was as great at a sound level of 115 decibels as at 90 decibels.—**The Electrical Journal, Dec 6, 1957.**

Public power systems will increase construction expenditures about 30% in 1958. They will spend an average of $277 million a year during the years 1958-62.—**Public Power, Dec 1957.**

TECHNICAL NOTES

Cost of putting high-voltage lines underground is just as expensive in Great Britain as in the U. S. A 275-kv underground cable costs 12 to 16 times as much to install in England as an equivalent overhead line.

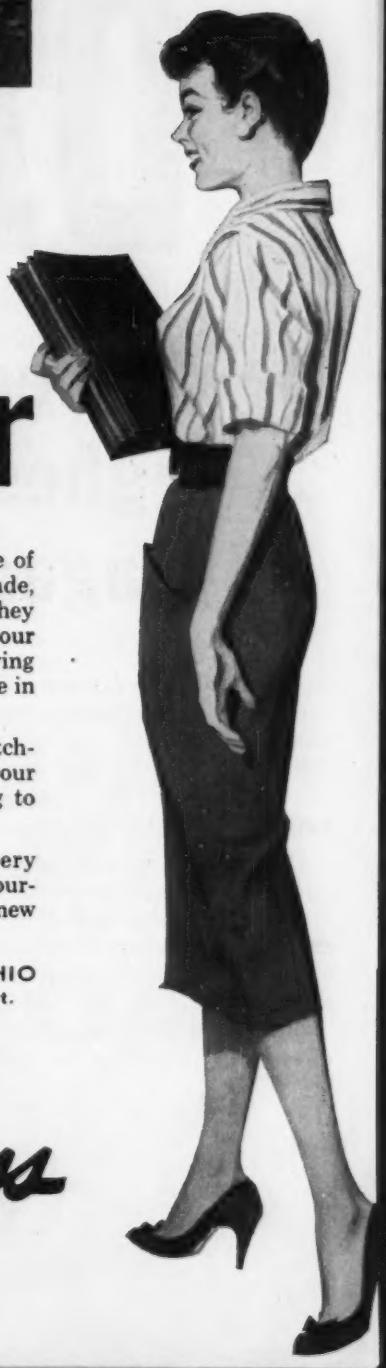
Perfluorinated liquids show promise as transformer coolants. Savings up to 75% have been gained by using them in radio transformers to operate up to 200C. Extensive tests have demonstrated low dielectric constants and relatively high breakdown, ability to inhibit corona, power factors comparable with those of conventional transformer oil, and desirable thermal characteristics.



Thirty-five years ago this station was built with O-B insulation. Records show a phenomenal service history that has led to many subsequent O-B installations in intervening years on the same system. Examination of your own past records will probably show similar facts — and suggest similar action.

ASK YOUR SECRETARY "WHAT'S THE BEST STATION INSULATOR BUY"?

She has the Answer



Records tell when substations were built, what make of insulation was used, what replacements have been made, and why. These are *your own records.* The facts they contain are on your own terms. In a few minutes, your secretary can lay before you the best reason for specifying O-B station insulators — and that reason may even be in your own handwriting!

With the facts before you — remembering that switchgear manufacturers will gladly supply insulators of your choice — be guided by your own experience relating to service life and maintenance expense.

To continue getting better mileage out of every insulation dollar, specify O-B insulators in your purchases of switches and unit subs, as well as in new stations of your own construction.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass

CONTAMIN DAMAGE

Now Effectively Controlled—Even at Highest Voltages—By Thorex Dynagap Lightning Arresters

Lightning arrester damage caused by surface contamination has finally come under effective control at all voltages, even above 300 kv! Basic cause of this damage - - multi-unit construction - - has been eliminated by the new Thorex electrically-continuous porcelain housing.

Prior to this improved design, surface leakage currents were introduced into the sensitive internal arrester circuit at each stacking connection. Severe cases of contamination leakage had the effect of shorting-out one or more units. This imposed destructive voltage in excess of rating on the remainder of the stack. The hazard increased directly in proportion to the number of units present; consequently, directly in proportion to system voltage.

Thorex Dynagap Type MPR arresters, regardless of voltage, are manufactured, shipped, erected, and operate as single-unit elements. Leakage currents stay on the outside and harmlessly bleed to ground. The cause of former contamination damage has been eliminated.

For the utmost in dependability - - in any category you can name - - protect your major station apparatus with Thorex Dynagap Type MPR lightning arresters.

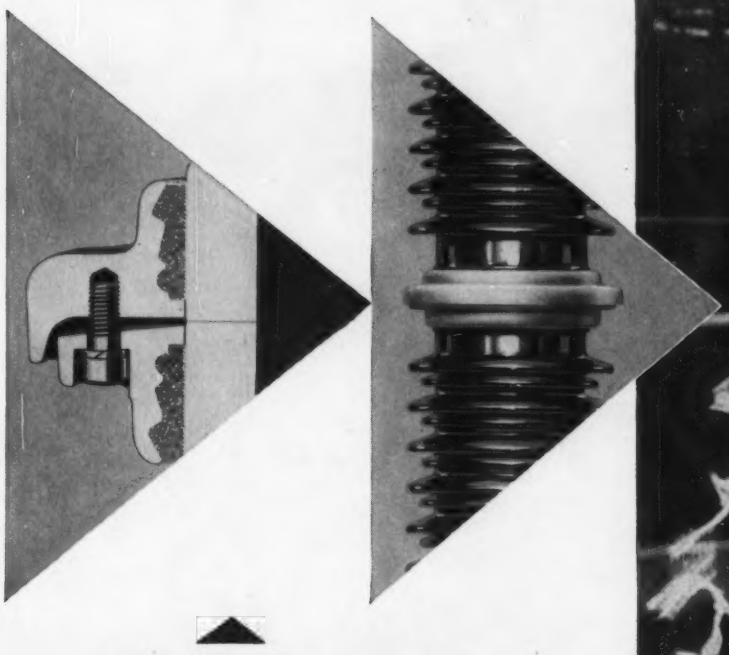
OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

3-H

ATION

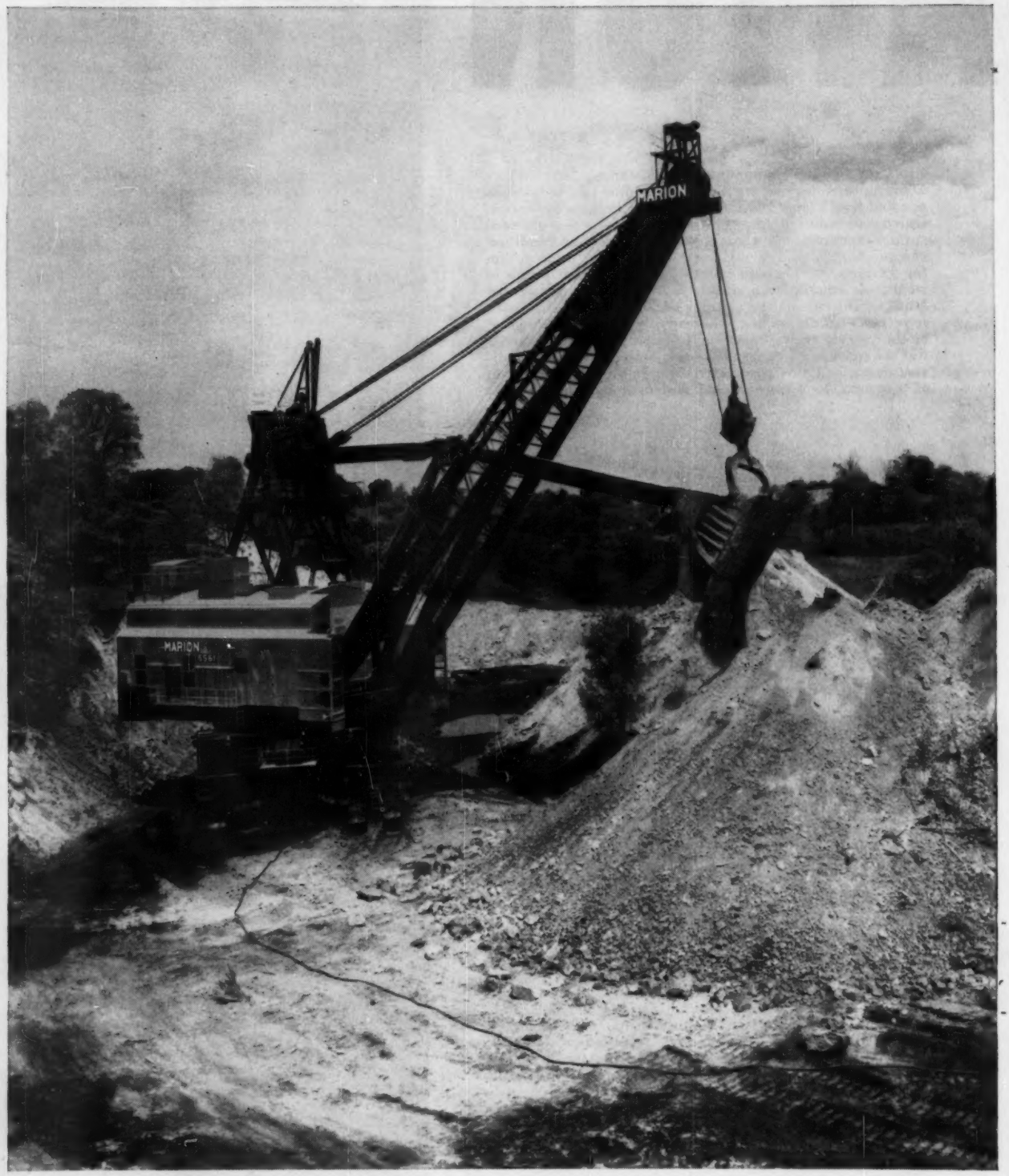
Proof of Thorex contamination resistance. This 345-kv Dynagap arrester was energized at full line-to-ground voltage and then exposed to intermittent application of concentrated salt solution in a wetting agent -- a more severe surface contamination than any known operating condition can produce. This test was sustained without interruption for 12 minutes. Leakage currents converted the water to steam, as can be seen at the upper-left portion of the housing. Surface of the arrester was constantly alive with inter-petticoat discharges, and flashover occurred frequently, as the picture shows. In the entire 12 minutes, the arrester did not spark over, or respond in any other way, to a condition that would have been destructive, in probably a fraction of a second, to a conventional design of multi-unit stack.



Above 169 kv line-to-ground rating, flanges are present midway on the porcelain housing. These comprise absolutely no electrical path to internal arrester elements. For convenience and economy in manufacturing, the housing is made in two parts with mating ends precision-ground and powerfully bonded by Epoxy resin. This material exceeds both the mechanical and dielectric strengths of porcelain. As an aid to assembly, externally-attached flanges draw the uniting faces into proper contact. These flanges remain in place and add high safety factors to an already exceedingly strong bond. Electrically, the joint "does not exist" and, in all functional respects, the Thorex MPR is a single unit.

See how they work that

At this giant strip mine, the Tiger Brand Amerclad (shown in foreground below) is tortured by being dragged over razor-sharp rock and constantly pelted by flying fragments that are being blasted. It lies in the sun, rain and snow during the 24-hour workday.



Tiger Brand Amerclad

In wet or dry locations!

VERY FRANKLY, we do not make a range of Tiger Brand Amerclad qualities. When you see the Tiger Brand Amerclad mold identification on a length of portable cord or cable, you can be quite sure that nothing better can be purchased, no matter how much you want to spend for it.

The reason is that American Steel & Wire has catered strictly to the *heavy-duty* market where portable cord or cable is concerned. We're well aware that cable failure can be one of the most exasperating production difficulties that you can encounter. Expensive too, because nothing operates without power.

So the greatest care is lavished on Amerclad. Every inch of cable is vulcanized in a freshly cast lead sheath to insure a dense, tough, homogeneous sheath. Mechanical skimmers remove dross from the lead-melting pots, and the pots themselves are kept in an inert gas atmosphere to prevent formation of impurities.

The result is an amazingly tough and durable cable with precisely centered conductors that withstands mechanical abuse, water, oil, grease, gasoline, ozone, heat and cold. Ask your AS&W salesman for the story . . . and a catalog.

AMERICAN STEEL & WIRE DIVISION
United States Steel, General Offices: Cleveland, O.
Columbia-Geneva Steel Division, San Francisco,
Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala.,
Southern Distributors
United States Steel Export Company, New York

The workman is holding an electric concrete tamper that knocks the entrapped air out of the mix before it sets—giving a denser, stronger concrete. The tamper is equipped with Tiger Brand Amerclad. It's dragged through wet concrete, over piling and beams, run over by trucks. Yet the manufacturer says he has never had a complaint about the cable.

Watch the **United States Steel Hour** on TV every other Wednesday (10 p.m. Eastern time).

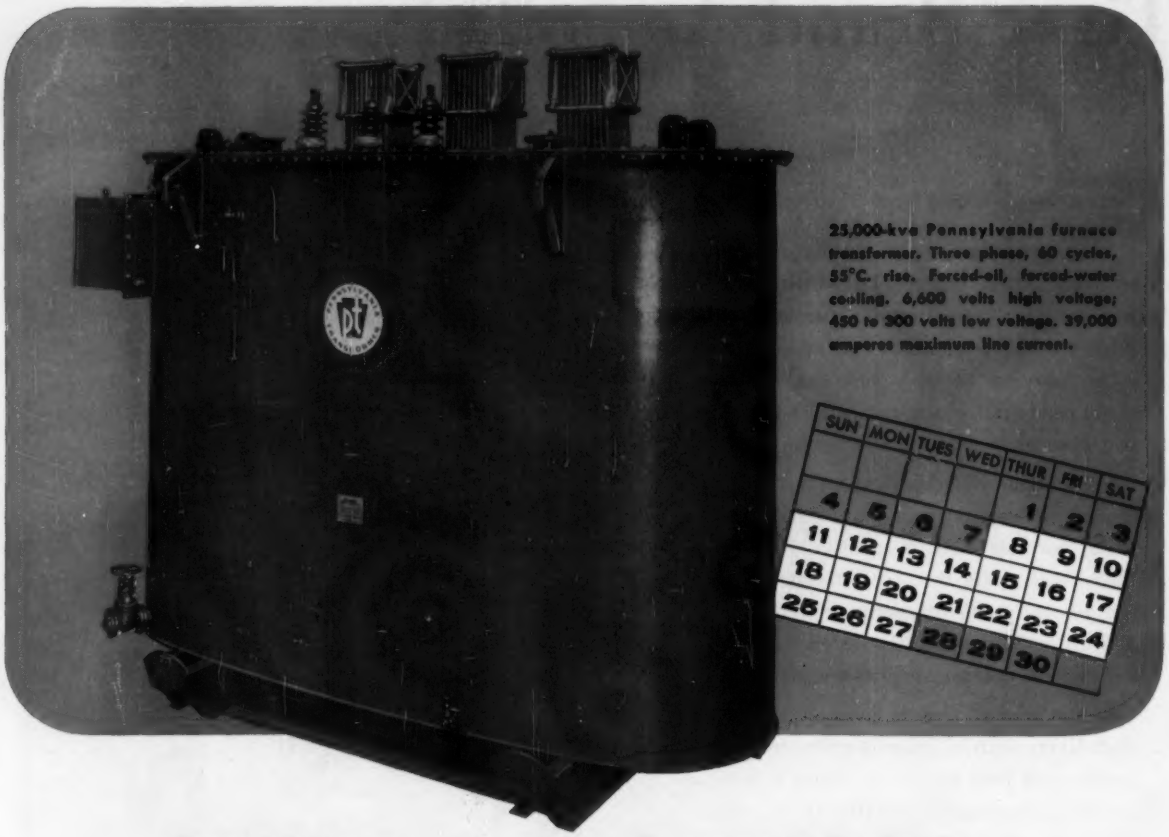
USS TIGER BRAND ELECTRICAL WIRE & CABLE

a standard Tiger Brand cable for every special job

- Asbestos Wire and Cable
- Mold Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

UNITED STATES STEEL

USS TRADEMARK


25,000-kva Pennsylvania furnace transformer. Three phase, 60 cycles, 55°C. rise. Forced-oil, forced-water cooling. 6,600 volts high voltage; 450 to 300 volts low voltage. 39,000 amperes maximum line current.
SUN MON TUES WED THUR FRI SAT
4 5 6 7 1 2 3
11 12 13 14 15 16 17
18 19 20 21 22 23 24
25 26 27 28 29 30

BUILT and SHIPPED in *20 Calendar Days!*

25,000 KVA FURNACE TRANSFORMER

by Pennsylvania

Even the *promised* shipping date of four weeks looked like excellent service to the West Coast steelmaker — and yet Pennsylvania was able to cut the allotted production time by more than one-fourth! As a result, the electric steel furnace for which this 25,000-kva replacement unit was built was put back into service even sooner than expected, and several days of costly downtime were averted.

Throughout the years, Pennsylvania Transformer has established a nation-wide reputation for tackling — and solving — the most difficult transformer problems, whether they involve short-time delivery or special design requirements. Particularly in the highly demanding furnace transformer field has this been true. Only recently Pennsylvania designed and built a record-breaking 82,000-ampere unit . . . and more than once have furnace transformers with special requirements been designed, built and shipped in less than two months.

Of course it takes a lot of "everyday" know-how to accomplish the unusual, and Pennsylvania has designed and built virtually every size and type of furnace transformer now in use: from 250 through 25,000 kva, and from 3175 through 82,000 amperes. Why not put this furnace transformer experience to work for you? Pennsylvania Transformer Company, A McGraw-Edison Company Division, Canonsburg, Pa.

PENNSYLVANIA PENNSYLVANIA pt TRANSFORMER **FURNACE TRANSFORMERS**

ONE SOURCE FOR EVERY INDUSTRIAL LIGHTING NEED!

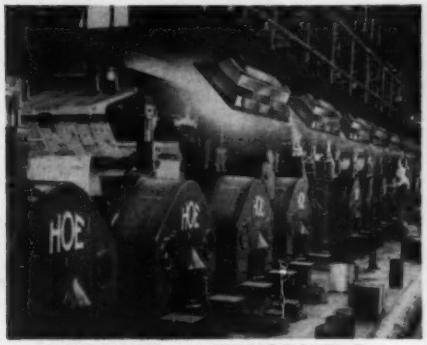
SOLID NECK LINE Sturdy, attractive one-piece units provides quality illumination at low cost for **Factories** and **Warehouses.**

"FLO-LINER" Smartly styled shallow lighting units for any **Commercial** or **Office** installation.

"BI-FLO UPLIFTER" 72% downlight — 28% uplight, provides greater seeing comfort for industrial areas such as **Assembly Lines.**

"D" LINE High efficiency, all-purpose fixtures with upward component of light to relieve severe brightness contrast. Ideal for **Machine Shop** and **Factories.**

DURATACH LINE Rugged fixture that offers easy, low cost maintenance plus complete interchangeability. Widely used in **Industrial** and **Textile** plants.



"DUST-TIGHT" and **"VAPOR-TIGHT"** Specialized fixtures for hazardous and non-hazardous locations such as **Printing Plants, Flour Grain Mills, etc.**

and now Power-Lume

latest addition to *Wheeler*

"PACKAGE PLAN" lighting

Power-Lume by Wheeler — a new fixture in 2 types of Construction "F" and "V" . . . specifically designed to utilize fully the extra illuminating power of the new Power-Groove lamps. Delivers TWICE the amount of lumen output per foot of lamp length! For complete details, write for New Product Data Sheet No. 100 D.

Wheeler

REFLECTOR COMPANY

(Division of Franklin Research Corp.)

275 CONGRESS STREET

BOSTON 10, MASS.

Distributed Exclusively Through Electrical Wholesalers

This Strand Is Armored

. . . armored against attack by rain, snow, sleet, ice, and fume-laden air.

It's Bethlehem strand with the ductile bethanized coating that frustrates corrosion. It's the strand with the long life-expectancy. You can install it with complete confidence, and forget about it for years.

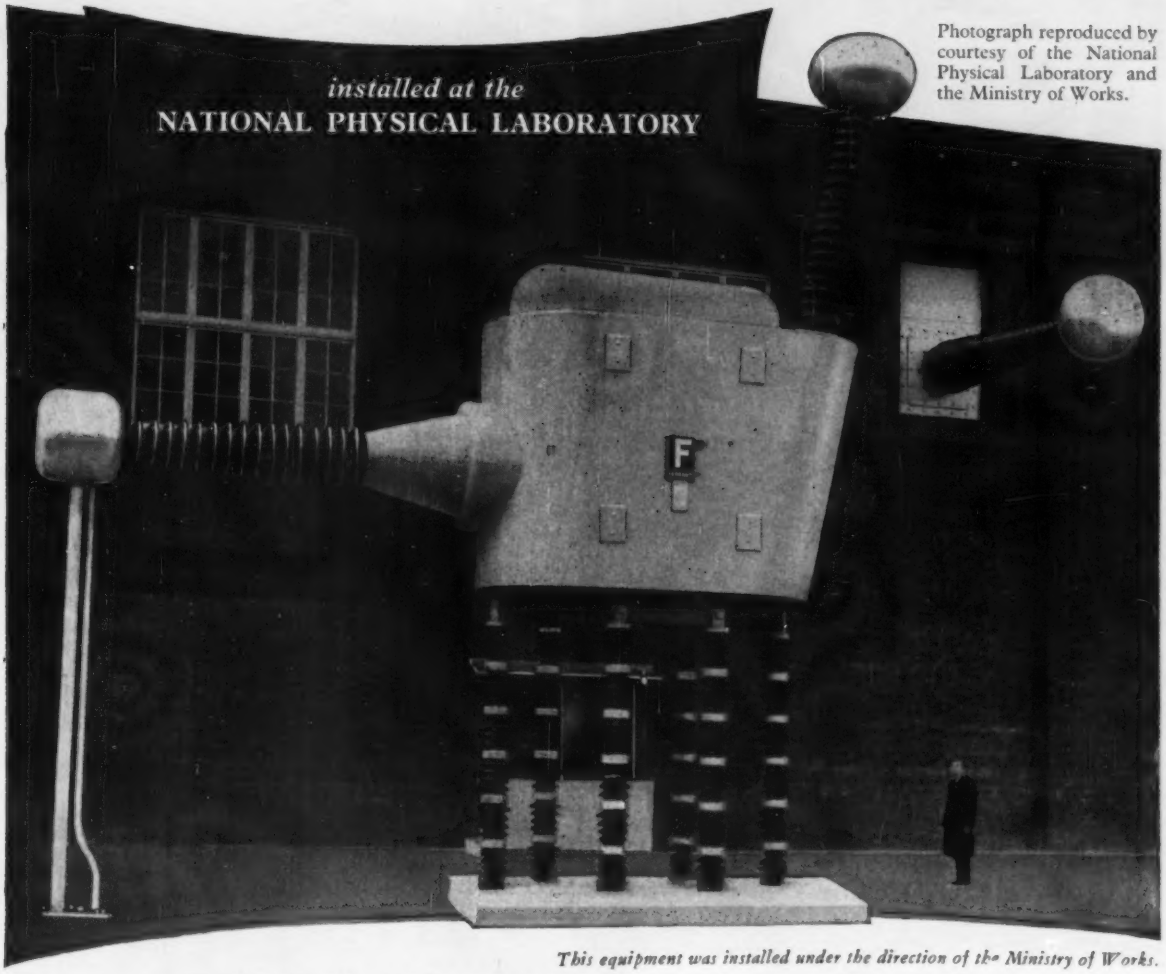
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

1,000,000 VOLT FERRANTI TESTING TRANSFORMER



Photograph reproduced by courtesy of the National Physical Laboratory and the Ministry of Works.

This equipment was installed under the direction of the Ministry of Works.

THE HIGHEST VOLTAGE OUTDOOR TESTING TRANSFORMER IN THE UNITED KINGDOM

A 1,000,000 Volt Ferranti Testing Transformer operating with the tank at a potential of 500,000 Volts above earth. The transformer is mounted on 6 columns of insulators at a height of 12 feet from ground level. The overall height of the complete equipment is 36 feet. Associated with the equipment is a 1,000,000 Volt wall bushing, 36 feet in length, through which the supply is carried to the test laboratories.

Ferranti are specialists in the manufacture of High Voltage A.C., D.C. and Impulse Testing Equipments for all kinds of research and routine testing and are backed by over 70 years' experience in the manufacture and development of electrical apparatus.

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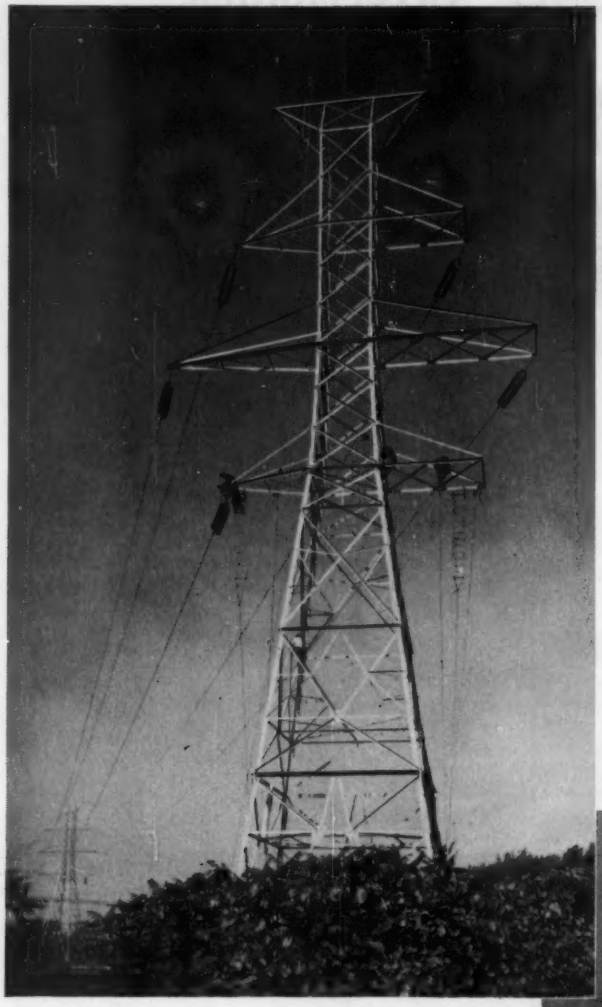
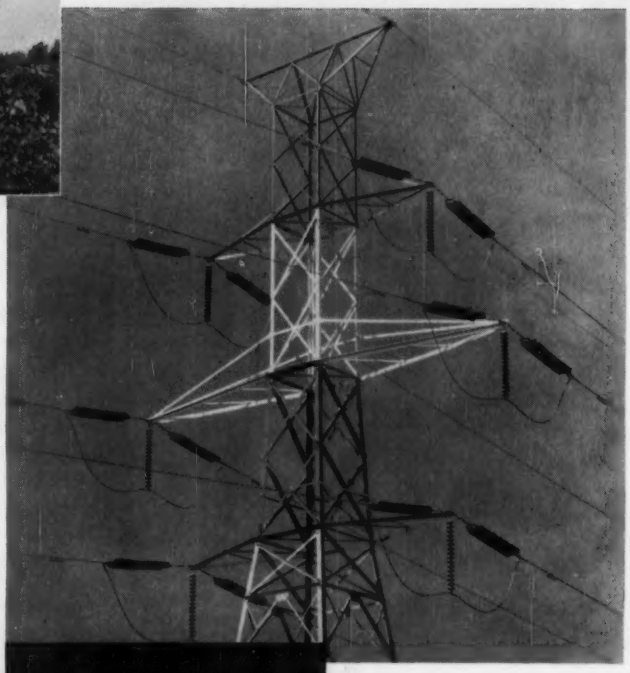
WYTHENSHAWE: Cheshire, England.
WEST GORTON: Manchester 12, England.
GEM MILL: Chadderton, Lancs., England.
EDINBURGH: Ferry Road, Edinburgh 5, Scotland.
DUNDEE: Kings Cross Road, Dundee, Scotland.



MORE Lapp 25,000-lb. insulators for NIAGARA-MOHAWK 230-kv system

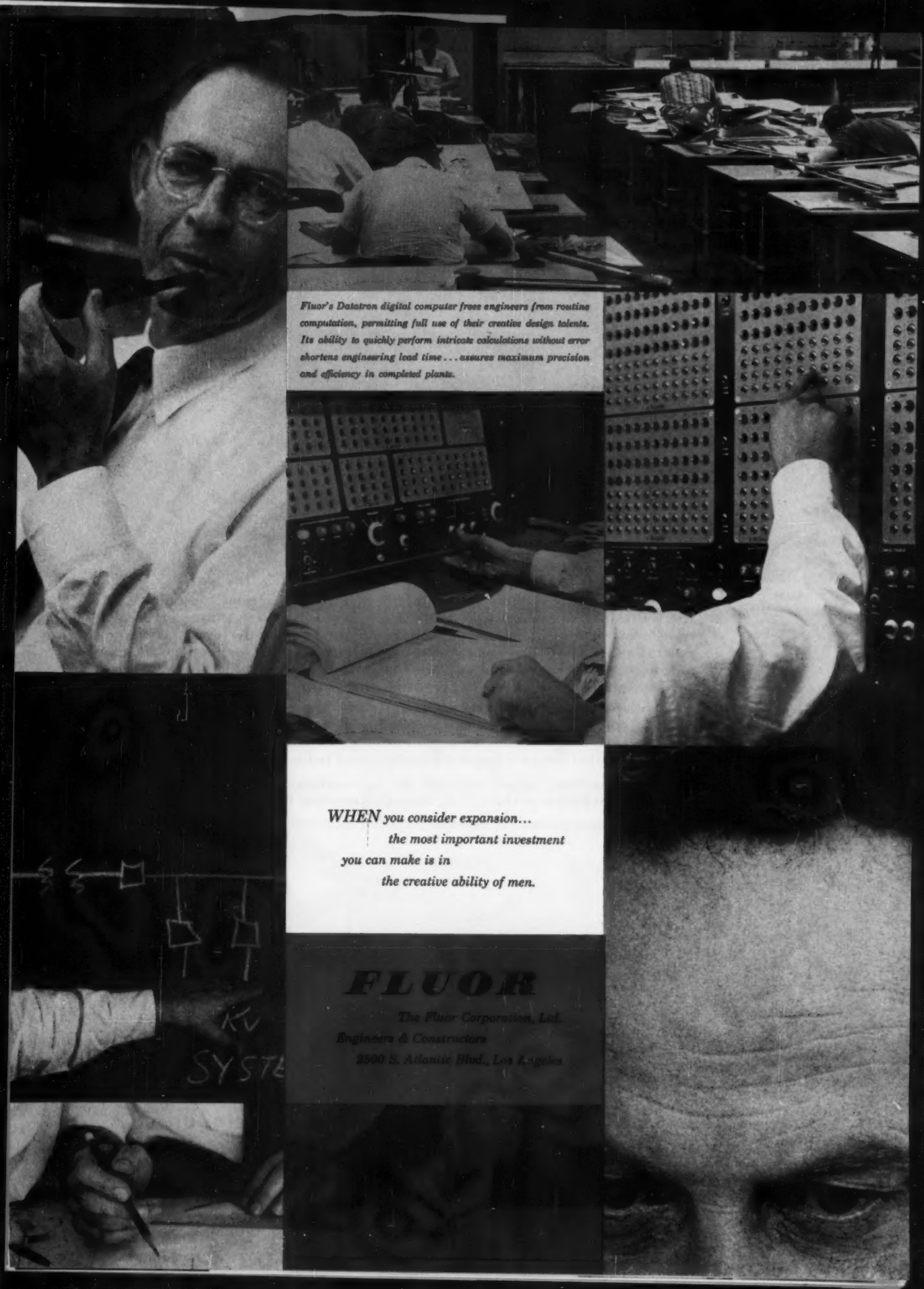


This new Huntley-Gardenville line on Niagara-Mohawk Corporation's system is 21 miles long, 230 kv, double circuit. Tower heights average 123 feet. Maximum span is 1250 feet, minimum span 400 feet. Conductor is 1192.5 MCM ACSR. Insulators used include Lapp No. 8200 (15,000-lb.) units in suspension strings; and Lapp No. 5960A (25,000-lb.) units, two-string yoked, for dead-ends, as shown here.

Niagara-Mohawk is one of many utilities whose service records on Lapp suspension insulators merit confidence. Lapp was pioneer in belief . . . and demonstration . . . that suspension insulators could combine electrical security, long life and consistent high strength. For your new construction at EHV . . . and regular transmission voltages . . . Lapp insulators will give you an extra margin of security in all these characteristics.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp



Fluor's Datatron digital computer frees engineers from routine computation, permitting full use of their creative design talents. Its ability to quickly perform intricate calculations without error shortens engineering lead time . . . assures maximum precision and efficiency in completed plants.

WHEN you consider expansion...
the most important investment
you can make is in
the creative ability of men.

FLUOR

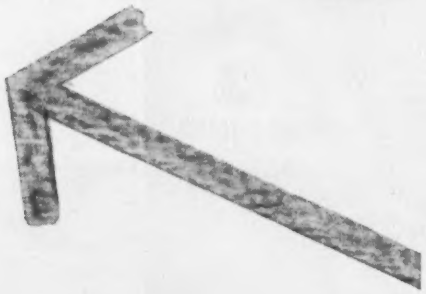
The Fluor Corporation, Ltd.
Engineers & Constructors
2500 S. Atlantic Blvd., Los Angeles

THE RIGHT DI

in design of utility systems is a composite of all that is proven and reliable in the individual components. A close inspection will reveal that generators, transformers, motors, meters, switchgear and controls—so necessary for power generation, transmission and distribution—all utilize AMP for connection and termination on the original equipment you purchase. For added reliability on your own equipment you can demand no less.

Standardize on AMP for generating and sub-station construction and maintenance, communication, panel and switchgear wiring, street and traffic lighting, appliance and meter repair and all other applications where terminals and connectors must produce improved quality, cost reduction and reliable service.

A-MP terminals, when required for maintenance and repair needs, are available in the U.S.A. through American Pamcor Inc. api AMERICAN PAMCOR INC.

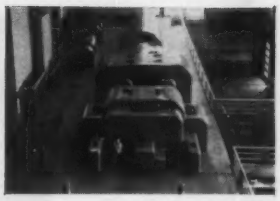


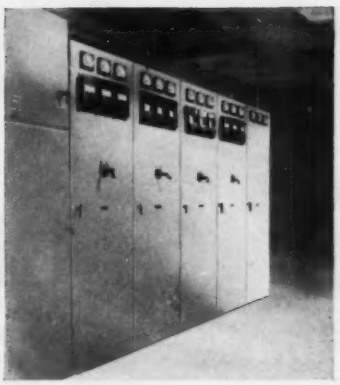
AMP INCORPORATED

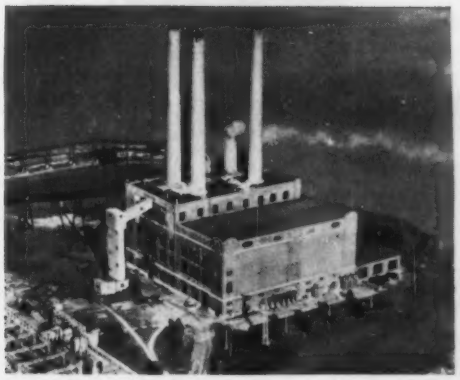
GENERAL OFFICES: 7241 EISENHOWER BOULEVARD, HARRISBURG, PA.

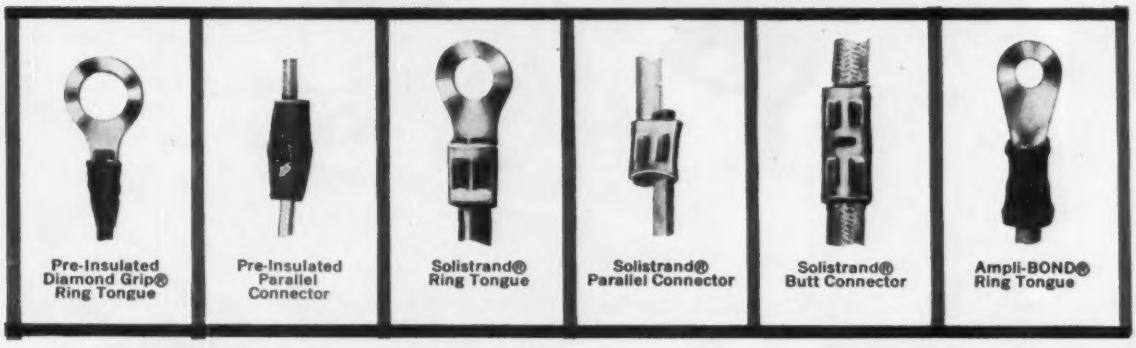
Wholly Owned Subsidiaries: **Aircraft-Marine Products of Canada Ltd., Toronto, Canada • Aircraft-Marine Products (Great Britain) Ltd., London, England • Societe AMP de France, Le Pre St. Gervais, Seine France • AMP—Holland N.V. 's-Hertogenbosch, Holland •** ***Distributor in Japan:*** **Oriental Terminal Products Co., Ltd., Tokyo, Japan**

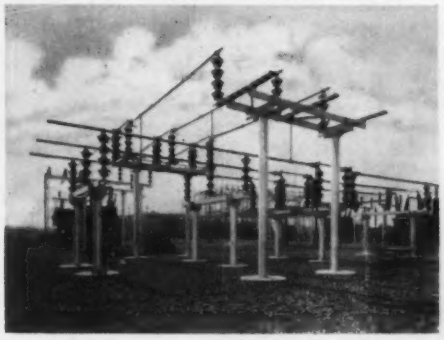
RECTION

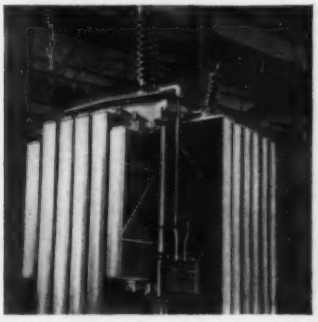




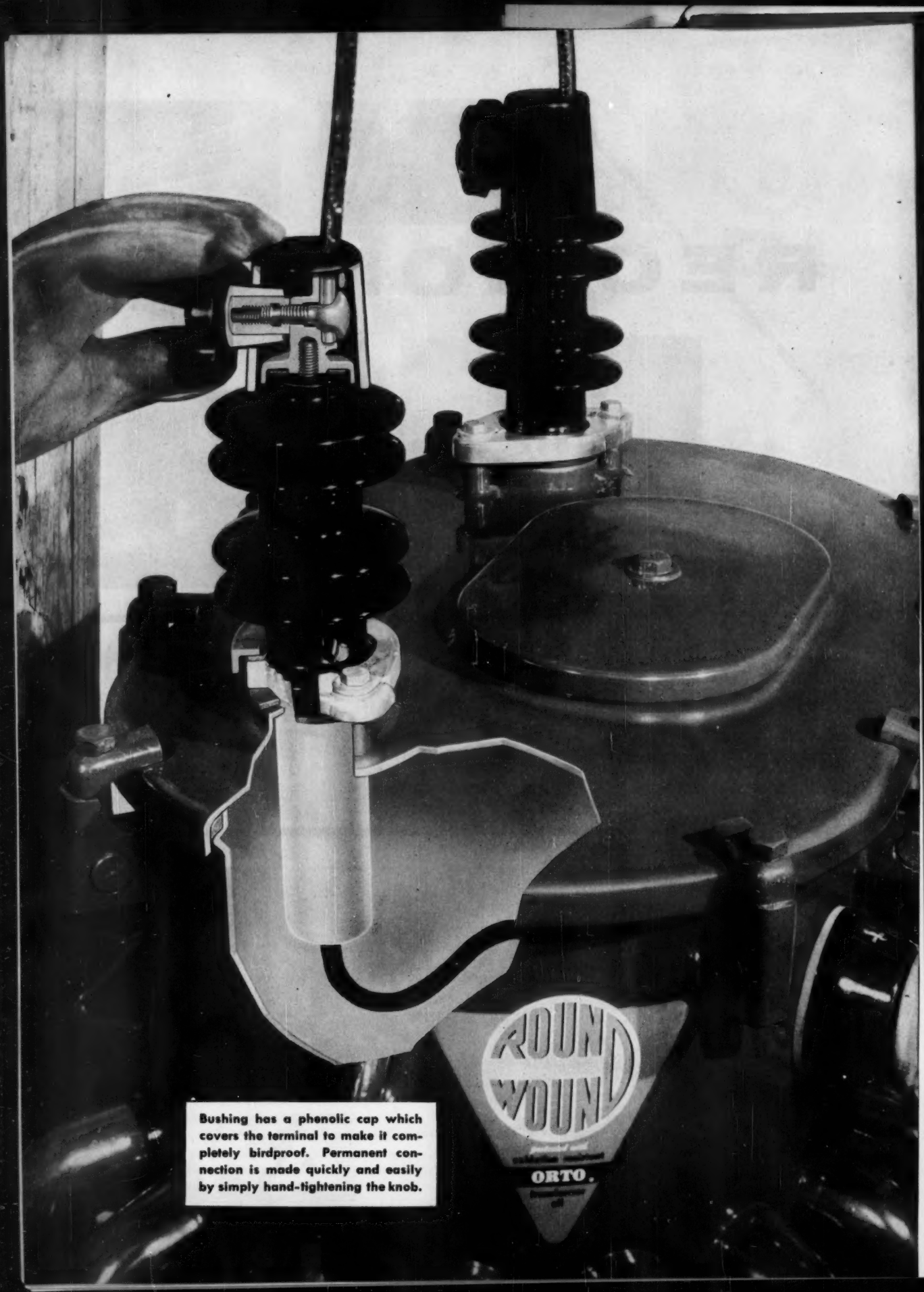



Pre-Insulated Diamond Grip® Ring Tongue
Pre-Insulated Parallel Connector
Solistrand® Ring Tongue
Solistrand® Parallel Connector
Solistrand® Butt Connector
Ampli-BOND® Ring Tongue





AMP®



Bushing has a phenolic cap which covers the terminal to make it completely birdproof. Permanent connection is made quickly and easily by simply hand-tightening the knob.

Here's Why

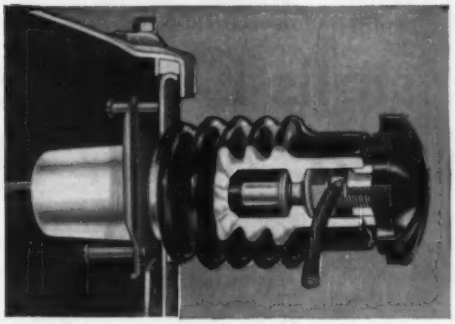
L-M Bushings Reduce Outages– Assure Safe, Easy Installation

By R. W. HARTSOOK
Chief Engineer
Small Distribution Transformers
Line Material Industries

Both the cover-mounted and sidewall-mounted high-voltage bushings on L-M transformers are fully insulated to eliminate outages caused by birds and animals contacting the terminal. The bushings also have a hand-tightening knob so terminal connection can be made securely, with ease and safety.

Standard Arrester Mounting

The cover bushing has a phenolic cap which covers all exposed live parts of the bushing. The cap has a drain to prevent water accumulation. When lightning arresters are installed as part of the transformer unit, they can be mounted in the regular manner and gapped through a slot provided in the insulating cap.



Cutaway view of bushing shows the heavy connector that grips the conductor. Handle cannot come off accidentally, but it can be removed intentionally.

Good Clamping Pressure

The connector knob on the bushing is large, giving plenty of leverage. A firm connection is made quickly and easily without tools or removal of any parts. Even with a gloved hand the lineman can get a good grip, so hand-tightening is all that is necessary for a permanent connection.

Bushing connectors comply with all EEI-NEMA specifications, including vertical take-off.

Sealed Against Moisture

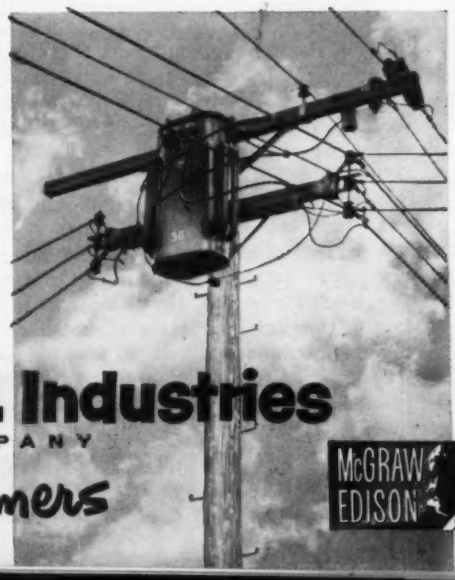
The cover bushings on L-M transformers are externally clamped to a cover boss which is raised well above the surface of the cover. Between the boss and the wide skirting of the bushing is a corprene gasket which assures excellent sealing. Surface moisture cannot flow into the bushing entrance.

A simple two-piece external clamp holds the cover bushing firmly in place. No nuts or clamping parts are used internally. The porcelain can be removed or replaced quickly and easily without removing the tank cover.

Sidewall bushing design is also leak-proof and inherently siphon-proof—moisture can't be drawn in; oil can't seep out. Sturdy internal clamping reduces the length of porcelain on the outside of the tank and thus reduces the required pole space.

Get Complete Information On L-M's Round-Wound® Transformers

L-M's bushing design is only one of many plus features found on L-M Round-Wound transformers. The most important thing about these transformers is their outstanding performance. Ask your L-M Field Engineer for complete information and bulletins. Or write Line Material Industries, Transformer Division, Zanesville, Ohio.



LM® LINE MATERIAL Industries
McGRAW-EDISON COMPANY
Transformers

McGRAW EDISON

L-M 6-FOOT 4-LAMP FLUORESCENT UNITS in the main shopping center of Lake Geneva, Wisconsin. Units are at a 30-foot mounting height, at 55- to 60-foot staggered intervals. The four 100-watt lamps in each unit provide 5350 lumens, giving an average maintained illumination of 2.00 foot-candles, compared to .13 foot-candles of the old-style upright luminaires.

Lake Geneva Installs L-M Fluorescents For Better Lighting, Better Shopping

DEAN VAN NESS
City Manager
Lake Geneva, Wisconsin

"One of the most forward steps this city has taken in a number of years," says Dean Van Ness, City Manager, about the new L-M fluorescent street lighting system, recently installed in the beautiful southern Wisconsin resort city of Lake Geneva.

"City officials and citizens are well pleased with the appearance—both day and night. The lighting is most effective," adds Manager Van Ness.

The quarter-mile White Way layout in this famed resort center was created in cooperation with the Wisconsin Power & Light Company. L-M 6-foot shallow 4-lamp luminaires are mounted on 6-foot davit arm aluminum poles with 30-foot light centers. Poles are staggered at 55- to 60-foot intervals. The system gives an average maintained illumination of 2.00 foot-candles on the street, compared to .13 foot-candles of the old-style upright luminaires.

L-M fluorescent lighting like Lake Geneva's offers several important advantages. (1) Good lighting increases nighttime in-town shopping. (2) Traffic accidents are reduced. (3) Petty thievery is cut substantially, or eliminated, in lighted areas. In addition, L-M fluorescents provide low operating and maintenance costs. The special design utilizes the greatest proportion of the light with practically no glare. And L-M's unique wiring feature makes installation easy, fast, and economical.

Ask for Bulletin

Ask the L-M Field Engineer or Lighting Specialist for information on L-M's lighting application engineering for streets, shopping centers, and airports, and for a free copy of bulletin on L-M fluorescent outdoor lighting. Or write Line Material Industries, Milwaukee 1, Wisconsin.

McGRAW EDISON

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LINE MATERIAL Industries Outdoor Lighting

McGRAW-EDISON COMPANY

Editorial Comment

JANUARY 20, 1958

Where to Draw the Line in the Advertising Fight

The Internal Revenue Bureau is now conducting a field study to determine whether advertisements taking a position on public issues, such as the public-private power controversy, are deductible as necessary business expenses.

Ads placed by the Electric Companies Advertising Program are under fire. And more recently, the American Public Power Association has challenged the Guaranty Trust Co ad carried in the Oct. 28, 1957 issue of Electrical World (see page 41 of this issue). The Guaranty Trust ad pointed out some of the tax inequities as between publicly- and privately-owned electric utilities and noted that the securities floated by public bodies are tax exempt.

It is clear to us that business firms have a right to put their views before the public especially where customer and public good will is concerned. It is prudent, we think, to do this job in the most effective way available to management.

Certainly the views of the federal power advocates find their way into public print. At least two Congressional Committees (the Kefauver Committee on the Senate side and the Chudoff Committee on the House side) have devoted considerable time during the past three years to publicizing the federal power point of view. Using their government offices, committee reports, and interviews, they have secured literally hundreds of columns of space in newspapers and magazines.

These committees, which cost taxpayers many thousands of dollars in direct expense, have enjoyed the cooperation of federal power advocates from many quarters—federal employees, associations, and individual employees government bodies.

To a considerable degree, the national advertising sponsored by electric companies and their business associates is an attempt to retain the good will and confidence which Congressional committees have sought to undermine. This advertising is necessary to build both customer acceptance and investor confidence—two very vital ingredients of any utility operation.

We firmly believe that management has the duty and the right to build its customer, investor, and public relations as a necessary part of doing business.

We know of no more effective way of accomplishing this duty than through advertising.

Eisenhower's 1959 Budget Puts a

- Message recommends federal credit programs, including REA, charge adequate interest rates on loans; $125-million TVA bond financing
- Power spending of $587 million recommended, a decrease of $77 million under current year. No new starts proposed for USBR or Corps

Growing preoccupation with increased national defense expenditures has had its effect on federal power programs in President Eisenhower's 1959 budget message to Congress.

The President proposed no new starts for either the Bureau of Reclamation or the Corps of Engineers. He calls for the "greatest possible economy" in the use of federal money for natural resources programs. And he recommends that federal credit programs charge adequate interest rates on loans and that they substitute private financing for federal loans wherever possible.

This interest rate facet is the power feature that will probably be most controversial. His recommendation includes Rural Electrification Administration lending.

Eisenhower said some programs will be curtailed and others stretched where it can be done without impairing prior investment. In spite of the admonition for economy, the 1959 budget shows increased expenditures in the natural resources category of $35 million over the current year. The 1959 total for such expenditures is estimated at $1.5 billion. Of this, $1 billion will be for water resources development. The increased outlay will continue projects already started.

As in the past, the President has again urged more participation by state and local agencies and private interests in conservation and development programs. In particular, he says, there should be a consistent basis of local sharing of the costs on all projects which benefit local groups.

Total power expenditures show a decrease under the current year—$664.9 million as against $587.1 million. Tennessee Valley Authority plans to spend $115.8 million of its power revenues for new steam generating plants. This is $25 million higher than TVA expenditures in the current year.

These are the budget highlights:

Atomic energy: Expenditures in 1959 will increase $250 million over 1958 to $2,550 million. The increase reflects a stepped-up tempo of nuclear weapons development and and a continuing push to develop the peaceful applications of atomic energy.

The message states that construction will proceed on experimental reactors for power and propulsion, on supporting facilities for reactor development, and on construction of four particle accelerators.

Rural electrification: President

Here's How Power Construction Funds Will Be Spent

Agency	Fiscal 1958	Fiscal 1959
	(Thousands)	
Tennessee Valley Authority		
Steam-Electric plants	$90,300	$115,800
Transmission.....	24,000	32,800
Rural Electrification Adm (Lending authority)....	323,000	175,000
Army Corps of Engineers		
Multipurpose projects	133,500	145,800
International Boundary & Water Commission		
Multipurpose projects	1,300	.....
Department of Interior		
Reclamation Bureau		
Multipurpose projects	59,800	84,800
Transmission.....	7,800	10,300
Bonneville Power Adm		
Transmission.....	24,300	22,000
Southwestern Power Adm		
Transmission.....	900	600
Totals	**$664,900**	**$587,100**

Porous Lid on Power Spending

Eisenhower states that about one half of REA electric power now goes to rural industrial and non-farm residential consumers. In the future these non-farm users will account for more of the increasing demands.

This situation, together with the present state of development of rural electric co-ops, clearly indicates that it would be in the public interest to broaden the sources of capital from which the REA system may obtain financing necessary for continued growth and adequate service to consumers, he states.

Therefore, says the President, legislation will be introduced in this session to assist both electric and telephone borrowers to obtain financing from private sources and to adjust interest rates on future loans to meet the government's cost of making such loans.

The budget proposes $150 million authorization for rural electrification, which with carryovers and cancelled loans from previous years will give REA $175 million in available loan funds in 1959. This compares with $323 million in 1958.

Tennessee Valley Authority: After standing on the sidelines last year on TVA revenue bond financing, the Administration this year is going to introduce its own revenue bond measure. The Administration bill will propose $125 million of bonds for new construction. This compares with the $750 million proposed last year in the Senate-passed Kerr bill and with the unlimited amount that would apply in the Davis bill pending in the House this year.

In arriving at the $125 million figure, President Eisenhower states that additional capacity for TVA to carry loads by the winter of 1961-62 is estimated to range between 600,000 and 1,200,000 kw. The $125 million will provide 600,000 kw. Construction now underway will provide 11,245,485 kw by the end of 1959 and 11,745,485 kw by the end of 1960.

The Cost Outlook for Reactor Development

Category	1958 Estimated (Thousands)	1959 Estimated (Thousands)
Civilian power reactors	$90,800	$97,700
Civilian power supporting effort	26,900	26,600
Commercial ship reactors	1,800	3,700
Army package power reactors	5,800	5,600
Naval propulsion reactors	86,800	87,000
Aircraft propulsion reactors	65,200	66,600
Controlled thermonuclear project	23,600	25,500
All other	33,900	38,300
Totals	$334,800	$351,000

Water Resources: While the Bureau of Reclamation has asked for no money for new projects, it will step up expenditures on the upper Colorado project. It is asking for $25 million for the Glen Canyon; $2.5 million for Flaming Gorge.

Reclamation's authorization request for 1959 includes $4.8 million for investigations, of which $1.2 million will be applied in Idaho and Oregon. A substantial portion of the $1.2 million will go for investigating the Pleasant Valley Dam site.

'Give-Away' Ad Protested

American Public Power Association has taken another whack at advertising critical of Tennessee Valley Authority and federal power.

Springboard for the latest go-'round is an ad published by Guaranty Trust Co of New York in Electrical World Nov. 25, 1957. So far it has produced this action by Alex Radin, APPA's general manager:

- Authorship of a 1,000 word letter to the president of the Guaranty Trust firm protesting the figures and conclusions in the ad, which is headed "Give-Away . . . With String Attached."
- Mailing copies of the letter to Federal Trade Commission and Internal Revenue Service.

The FTC already has told APPA that the commission doesn't have jurisdiction on this matter. It does rule on advertising of business firms, but Federal Reserve Board passes on bank ads.

Internal Revenue agents are conducting a field study to determine whether ads by business firms taking positions on public issues of this kind are deductible as a business expense. APPA has charged that such ads, particularly those sponsored by Electric Companies Advertising Program (ECAP), aren't deductible under the tax laws, nor a cost of doing business allowable in rate bases.

This issue is going to be kept alive during this session of Congress. Already, Rep Lester Johnson (D-Wis.) has introduced bills which would write into law the APPA recomendations.

C. H. **WHITMORE**, President, Iowa-Illinois Gas & Electric Co, Davenport, Iowa

We Need a New A-Power Policy

That is the conclusion you will probably draw after reading this article—a utility president's case for putting "private" companies on America's first-string nuclear-power development team. Here's a plan—and the reasons why a new policy is vital

A new impetus has been put behind atomic power research and development. In the words of Rep Irving Price (D-Ill.) who heads the Joint Congressional Atomic Energy Committee's subcommittee on research and development:

"Whether we like it or not, promotion of atoms for peace—including civilian atomic power development—is part and parcel of our foreign policy."

The present research and development program is not geared to provide atomic power as an instrument of foreign policy. Its aim is to get economically competitive nuclear power in time to supplement and ultimately supplant fossil fuel sources when necessary. This goal is a long way off.

A new approach seems to be in order. Why not call upon all the electric systems—investor-owned and government-financed—to construct and operate research and development reactors as prime contractors for the United States Government?

A-Power Without Socialization

The plan I propose here would speed atomic power development without further socializing the electric power industry. This plan would:

1. Repeal the "preference clause" of the Atomic Energy Act of 1954.

2. Make government financial assistance available to both private and publicly-owned power agencies without discrimination.

3. Award contracts for nuclear plants to public or private groups on the basis of maximum advantage to the government.

4. Provide an economic incentive for rapid atomic power development.

The investor-owned systems feel that if atomic power is allowed to develop under present laws and under present government policy, the ultimate extinction of the investor-owned industry will almost certainly result.

To see that there is a real danger, it is only necessary to look at the history of the "public-private" dispute in the power industry. The dispute grows out of five historical developments.

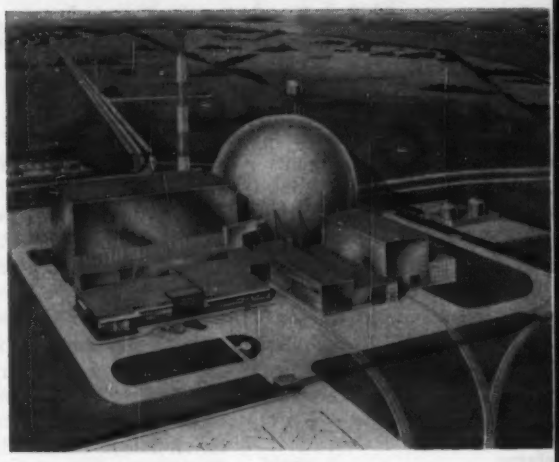
1. Municipal Ownership. Cities and towns can own their own water, gas or electric systems in most states. Many municipalities, motivated either by the absence of any electric service or by the belief that their needs would be better served by a publicly owned system, have built or purchased their own electric systems.

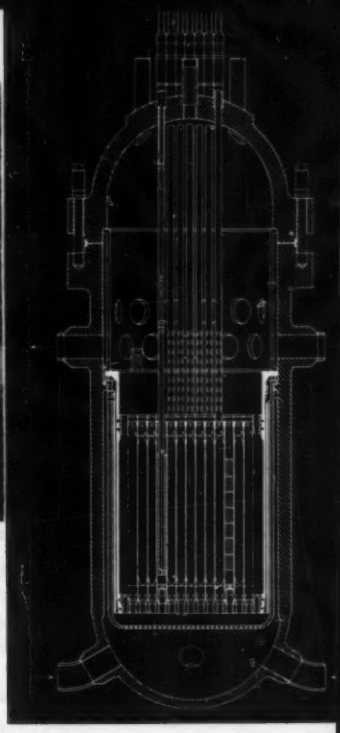
2. Conservation and Reclamation. In the stated interest of conservation of natural resources, including water, it has been national policy since the early 1900's for the government to construct or subsidize dams for flood control, irrigation, navigation, and incidentally, power. Flood control and irrigation were calculated to make added land available for cultivation, and the term "reclamation" thus came to be used in many of the statutes.

3. Government Competition and "The Yardstick." Some people feel that the investor-owned systems have been inadequately regulated by the state public service commissions and the Federal Power Commission. People taking that view have frequently recommended the creation of public agencies to own and operate electric systems to compete with or supersede the investor-owned systems, or to furnish a performance "yardstick" as a standard for regulating their rates.

4. The Rural Electrification Act. In the early 1930's it was the view of the federal administration that investor-owned systems had failed to give adequate service to farms, and that farms were "entitled" to such service even if, as the investor-owned systems

—and Fast!





generally contended, most rural systems could be built only by charging part of the cost to urban customers.

The administration's solution was to finance and help build cooperative electric distribution systems through the Rural Electrification Administration. Thus the government, through its power of taxation, did transfer a part of the cost to urban resident-taxpayers.

5. Public Preference. The Reclamation Act of 1906 required that the Secretary of the Interior give "preference to municipal purposes" in the sale of power from reclamation projects. It is evident from a 1912 report of the National Waterways Commission and from an opinion of the U. S. Attorney General issued in 1913 that this "preference" was intended to be in favor of such "municipal purposes" as street lighting and water pumping, and not necessarily in favor of the sale of power by the Secretary to a municipal agency for resale. The opinion further indicated that the "preference" only became operative where the "municipal purposes" would be equally advantageous to the government project.

Preference Broadens in Scope

However, the 1906 "preference" clause was cited as precedent for a different type of "preference" included in the Federal Power Act of 1920. As finally included in that Act (Section 7, Public Law No. 280, 66th Congress) preference was given to applications for waterpower licenses made by states and municipalities, provided that the plans for their projects were deemed equally as well adapted as other plans submitted to conserve and utilize in the public interest the navigation and waterway resources of the region.

The 1906 power-sale "preference" and the 1920 water-power-license "preference" had one thing in common: The public body was to have a "preference" only if its proposal was at least equal to that of the non-public body.

The late Sen George Norris of Nebraska introduced nine successive bills in Congress to bring about public ownership and operation of the Muscle Shoals properties on the Tennessee River in Alabama. The sixth bill, which was passed by Congress, introduced a new concept of "preference." This bill specified that contracts with investor-owned systems could be canceled on two years' notice if the power under contract to them was "needed" by "preference customers" (S. J. Res. 49, 71st Congress, 1st Session.) President Hoover vetoed the bill.

Norris' ninth bill, The Tennessee Valley Authority Act, as passed in 1933 and amended in 1935, permitted withdrawal of power from investor-owned companies on five years' notice (Public Law No. 17, 73rd Congress, H. R. 5081).

The most radical restriction on the sale of power is that contained in the Bonneville Project Act of 1937. That Act not only required the administrator to "give preference and priority to public bodies and cooperatives," but also provided that at least 50% of the available power should be set aside for use by preference customers up to 1941, and that the remainder could be disposed of only temporarily to non-preference customers until preference customers came forward to claim it (Public Law No. 329, 75th Congress, H. R. 7642, Section 4).

Other provisions of the Act instruct the administrator to give public bodies time to organize and become qualified "preference customers," and empower him to build the transmission facilities to get power to "preference customers."

The Fort Peck Act of 1938 contained restrictions on power sales to investor-owned systems, but in-

"The 'preference clause' in the Atomic Energy

cluded neither the withdrawal provision nor provisions to encourage the creation and financing of "preference" agencies (Public Law No. 529, 75th Congress, S. 2650).

The Reclamation Act of 1939 largely superseded the Reclamation Act of 1906, and changed the "preference" from "municipal uses" to "municipalities and other cooperatives or agencies . . ." as well as "cooperatives and other nonprofit organizations financed in whole or in part by [the R.E.A.]." The 1939 Reclamation Act also omitted withdrawal and "time for organization" provisions (Public Law No. 260, 76th Congress, H. R. 6984).

Laws Favor "Public" Systems

Thus we see that these federal statutes which purport to deal with "conservation" and "reclamation" contain many restrictions against awarding power-sales contracts and water-power licenses to investor-owned systems wherever such privileges are sought by government-financed systems. All these restrictions have become rather confusedly lumped together in popular idiom as *the* "preference clause."

At inception the various preference clauses did not appear to threaten the existence of the investor-owned systems for two seemingly practical reasons.

First, power was not transmitted over long distances, with the result that the power developed at government installations generally had to be sold fairly close to the source.

This supposed protection has been destroyed by the development of high-voltage, long-distance transmission.

Second, there was nothing to keep investor-owned systems from building their own hydro-electric installation, which could generate power to compete very closely in cost with the government installations.

Investor-owned systems can no longer compete closely on cost, because they must now pay over 22% of their entire gross revenues in taxes—principally the federal income tax.

A "preference clause" covering both licensing of projects and the sale of "by-product" energy from atomic plants is contained in the Atomic Energy Act of 1954 (Public Law No. 703, 83rd Congress, H. R. 9757). The Act is principally concerned with nuclear research and development.

If federal agencies—including the Atomic Energy Commission—could be counted on to operate atomic power facilities only for research and development, and not beyond the developmental period, the investor-owned system would have nothing to fear from nuclear power "preference," because nuclear power will not be economical in the foreseeable future.

However, the history of the development of power by government agencies has been consistent, and consistently alarming to investor-owned systems.

The Tennessee Valley Authority is an excellent case in point. Its chief proponent, Sen Norris, stated openly and repeatedly in congressional debates that TVA would have authority to produce electric power only as a by-product of its "welfare clause" powers derived from the constitution, which enabled it to build dams and waterways for navigation, irrigation, and flood control.

How has this worked out? The principal business of the Tennessee Valley Authority is now the production of electric power, and the pretense constructed by Sen Norris is ignored. As a matter of fact, TVA now develops 75% of its electric power by means of steam-electric generating stations and only 25% by means of "surplus" hydro power.

As viewed by the investor-owned systems, the stage is now set for a similarly political and uneconomic development of atomic power as a "by-product" of research and development—a precise counterpart of "surplus" hydro power developed as a "by-product" of conservation.

Under present law, the government itself may build atomic power facilities, and if this is done the operating agency is directed to give preference to "public bodies and cooperatives" over investor-owned systems in disposing of the energy produced (Atomic Energy Act, Section 44).

By a recent act (Public Law 85-162, Section 111, Aug. 21, 1957), demonstration power reactors are to be built and operated for not more than 10 years. They are then to be offered for sale to "public bodies or cooperatives." If not sold to such organizations, they are to be dismantled.

No subsidy can be given to investor-owned systems to build atomic plants, except to the extent that they may be able to apply the results of "research and development" performed by the government for the general broadening of knowledge in the atomic power field (Section 169, Atomic Energy Act of 1954).

Here is the groundwork for nuclear power development along lines parallel with the government's hydro development. If substantial atomic installations are built, and the power sold at "bargain rates" (after all, it *has* to be disposed of) industry and "cheap power users" will gravitate to the locale of these installations.

When the "developmental period" ends, a "power shortage" will develop—precisely as has occurred in the Northwest and in the Tennessee Valley when the water power developmental period ran out. Then the government will be called upon to build non-developmental plants (the steam plants of TVA), to allay the shortage.

Atomic "Preference" Is More Serious

It is the view of the investor-owned systems that if the laws covering atomic power are allowed to develop along these lines—with energy sold as a "by-product" and subject to "preference"—then the electric power-supply field, now over 20% dominated by government-financed systems, will become wholly a government operation.

This is founded on the assumption that the federal systems and the government-financed systems will be able to sell electricity at prices substantially below those that can be offered by the investor-owned industry.

Act has not yet operated...Why not repeal it?"

With the government-financed systems paying practically no taxes, and with the investor-owned systems paying over 20% of their gross revenue in taxes, it follows that the government-financed systems should be able to sell for $1 the same unit of service an investor-owned system could sell for $1.25, considering taxes only.

Add to this that the investor-owned systems must pay approximately 6% on money invested in plant, while the government-financed systems little (REA—2%) or nothing (TVA).

The government-financed systems will, logically, offer service at substantially lower prices than the investor-owned systems can quote. With a financial spread like this, will it not follow that the government-financed systems will ultimately have all the business? After all, hydro power is limited to some extent by availability of hydro sites and the feasibility of transmission. There is no such limit on nuclear power.

Investor-owned systems believe that in their resistance to the expansion of government-financed systems they are also defending other segments of investor-owned business. They point particularly to England and the Continent, where government domination of electric power has led to government subsidy, control, and ownership in other heavy industries such as coal, cement, steel, and railroads.

Government control of the power business has found support, certainly, in the utterances of some widely known Socialists. Commenting on President Roosevelt's program in 1934, Norman Thomas said:

"The only genuinely Socialistic act he has set up is the TVA, which I think is a good thing—a plan for the use of society, not for profit."

In 1928, H. Stephan Raushenbush had written in "The Socialism of Our Times:"

"We cannot hope to take the whole eight-billion-dollar [electric] industry, even if it were generally thought advisable to do so at the moment. There would be danger of sabotage. But by putting in a preference that power from these developments [reclamation, etc] shall be furnished by state and municipal plants, we can move toward a system of linked-up plants."

Later Raushenbush was employed by the Department of the Interior as Chief of the Planning Division, Power Section.

The investor-owned systems are alarmed (and, it is submitted, understandably) by the implications of "preference "in the Atomic Energy Act of 1954. The "preference" clause in that Act has not yet operated. It has not had time nor occasion to become "traditional." Why not repeal it, and thus avoid any concern that the development of atomic power will be used to further socialize the electric power business?

Here is one way the A.E.C. could enlist both investor-owned and government-financed electric systems to build and operate nuclear research and development power reactors:

How the Plan Would Work . . . .

The Commission would specify the entire project, including the general location (e.g., Southwest, North Central or New England), the life of the project in terms of years of operation, the costs to be recognized as reimbursible by the Government, and the price at which the output of the system would be sold to the successful bidder.

Bidding would be open to all power systems in the general area specified, with the successful bidder to own the plant and operate the entire project for the account of the Government at cost.

The Government would, in each case, pay any construction cost above the lump-sum bid and would pay all costs of operation; the Government would sell the output of the plant to the successful bidder at the price specified in the project as let, such price to be commensurate with the kwhr cost of the output of conventional plants in the specified area.

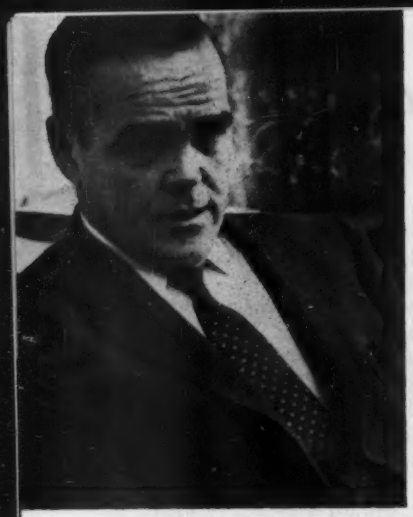
All projects would be awarded on the basis of the greatest financial advantage to the Government.

To furnish incentive for the operator of the atomic plant to get the cost down, contracts should provide that the contract price would be reduced to actual cost whenever the latter was reduced below the original contract price.

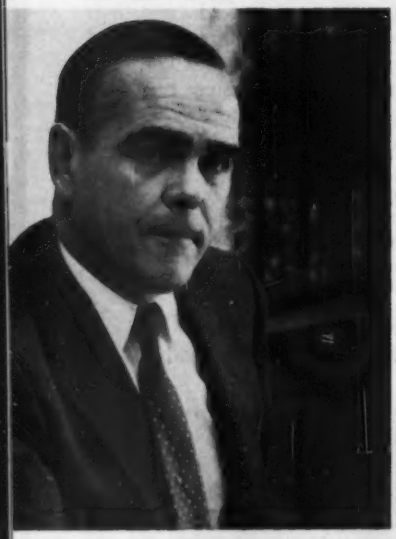
"An atomic power development program . . . without further socialization"

WHITMORE

These recommendations would need detailed study and refinement. However, it is submitted that the arrangements described would permit us, as a nation, to proceed with an atomic power development program geared to use as an instrument of foreign policy, if such is deemed desirable, without permitting that development to be used as a means of further socialization in the electric power field.



"We see acceleration for the industry's long-term growth trend"



"We intend to increase our investment in research . . ."

"Leadership in the nuclear power field is our major aim."

You Can Count on Growth,

Mark Winfield Cresap, Jr, took on a new job last month asW estinghouse Electric Corp's president and chief administrative and operative officer. The 47-year-old former management consultant succeeded Gwilym A. Price, who remains chairman of the board. In other changes E. V. Huggins, vice president and secretary, became a director, chairman of the executive committee, and a member of the policy and finance committee. John K. Hodnette, vice president and general manager, took on Cresap's former title of executive vice president. George G. Main became vice president of finance.

Aggressive, personable, candid, Cresap (rhymes with dress up) foresees a period of strong growth ahead for both his firm and the electric utility industry. In this Electrical World interview he defines this growth potential and clarifies the company's committee approach to management decisions.

Question: What do Westinghouse predictions show for the future of the electric utility industry?

Cresap: Traditionally this industry has doubled in capacity every ten years. We see an acceleration of this long-term trend. Recent growth has been doubling at the rate of every seven or eight years; we expect that to continue for the foreseeable future.

Opportunity for this growth is not only in the residential field—where it is favored by population growth, construction, and rising standards of living—but also in the industrial field which offers dynamic opportunity to expand the use of electricity. This is why Westinghouse has produced the "Power Up" program to accelerate the trend to mechanize.

Promotion of this program in 1958 can be a tremendous influence in accelerating the growth of electrical load. Already some 200 utilities are taking it to their industrial customers. The objective will be to make "Power Up Through Electromation" the biggest promotion Westinghouse ha. ever done. We hope other manufacturers will join to make "Power Up" an industry program.

Research has always contributed to improvement of Westinghouse products, development of new ideas, and new uses of electricity. Can utilities continue to lean on major manufacturers for this basic research?

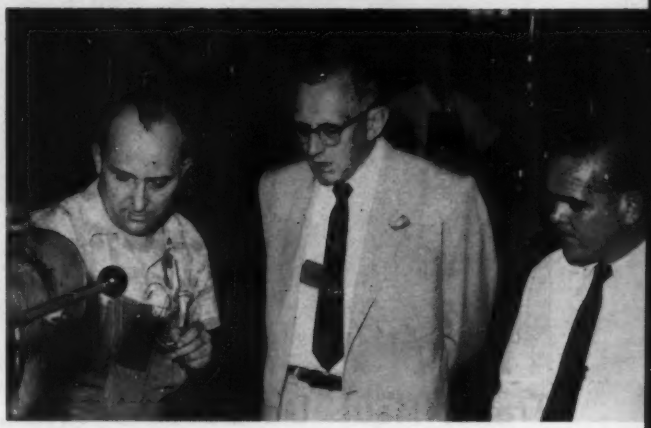
Absolutely. Failure to back up long-range development of utility equipment would injure the whole electrical industry. We intend to increase our investment in research substantially. In recent years it has grown faster than the dollar value of the business. But we have found that research applied to new production capacity has given us the ability to sell our products at a satisfactory margin because production cost is held down. This enables Westinghouse to compete for the business with other manufacturers who do not maintain such elaborate research organizations.

The new Westinghouse management team has been described as a "three man rule". If this a correct evaluation, how do you expect it to function more effectively in girding Westinghouse for the tough competition some economists see in the years ahead?

That evaluation is wrong. The policy and finance committee is a

Says Cresap, New Westinghouse Head

POLICY AND FINANCE committee finds Cresap, right, in session with E. V. Huggins, left, and Gwilym A. Price



PLANT TOURS will continue to bring Cresap, Executive Vice President John Hodnette, other officials to major divisions

committee of the board of directors, set up by it to act independently on some matters and, on more important questions, to act subject to ultimate approval by the board as a whole. It will function as part of the communication between officers of the company and the board. As for operation and administration of the Westinghouse business, that remains definitely the president's job.

How will the new organization affect design and production of electrical apparatus, particularly as regards to the position of engineering in management?

The new organization has made no change in Westinghouse engineering. Apparatus engineering, along with production and sales, remains under A. C. Monteith's direction as before. The policy and finance committee is concerned with decisions for the corporation, including financial. It will determine management's position on matters to be referred to the board of directors. For example, it is now reviewing what amount it should recommend to the board of directors to be appropriated from 1957 revenue as an annual management incentive.

As president, will you, with John Hodnette and other executives, continue your program of visiting all manufacturing divisions at least once a year?

Yes. We have found these visits valuable because: **1.** They get all Westinghouse people acquainted with management. **2.** They improve supervisors' knowledge of company policy. **3.** They make all plant personnel feel they are part of the Westinghouse Electric Corporation team.

Will Westinghouse continue to concentrate mainly on the power aspects of nuclear research and development?

This is still Westinghouse policy. Leadership in the nuclear power field is our major objective. The demands of this objective are so great that we consider it inadvisable to diversify our effort into other areas at this time.

How soon does the atomic products division anticipate showing a profit?

This division handles a mixture of military and private business. Over-all losses are very low now. We hope to be in the black by 1960. Efforts of the atomic industry must go into design and development. Until atomic power has been made economically competitive with other sources—and this cannot be done for several years—there cannot be a very big business in land power plants.

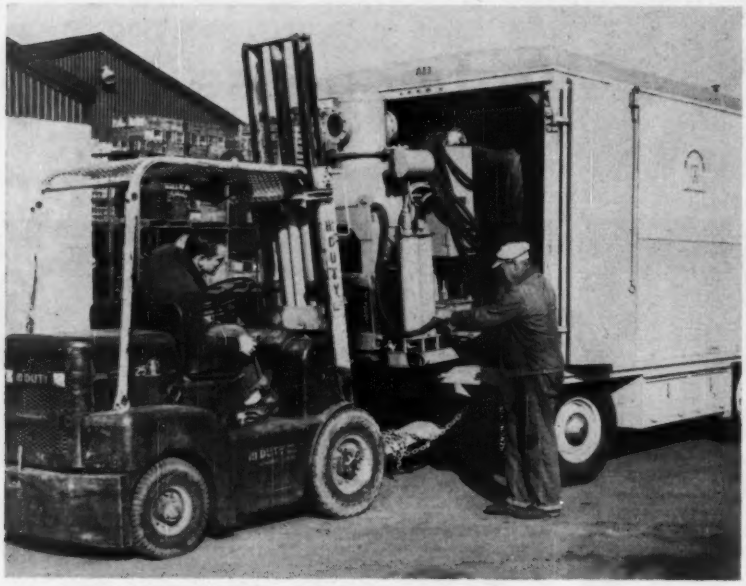
Has Westinghouse achieved progress in direct conversion of fuel to electrical energy?

At this time we can only say that the thermonuclear process looks favorable.

You recently said: " We have, in our industry, experienced a disturbing deterioration in rate of profit return. We cannot assure the long term health of our industry unless we receive fair prices for our products." What does this portend in Westinghouse dealings with utilities, which are caught in the same cost-squeeze but can raise prices only with regulatory commission sanction?

The deterioration exists across the board for all products manufactured. The price trend has not kept pace with increases in labor and material costs. The resulting squeeze concerns equipment manufacturers and electric utilities alike. The ability to

(*Continued on page* 99)



Trailer Hauls De-Gasifier Unit . . .

Then Converts to Meeting or Stock Room

Employees of Cleveland Electric Illuminating Co's cable and industrial section are getting more than just double duty out of their equipment-hauling trailer. The new unit is a good place for safety sessions and also comes in handy as a mobile stockroom when special cable jobs develop. The workers, all members of the company's metering and underground department, figure they've just scratched the surface of useful jobs for the trailer.

Original task for the unit was to haul the de-gasifier equipment shown above. The gear draws moisture and air from oil in an 80-kv underground cable. As a meeting place, the 7 x 13-ft trailer holds 12 men with room left over for demonstrations of artificial respiration.

R/W Meeting

. . . for electric utilities takes place March 6-7. Workshop and talks to stress costs, appraisals, training

The impact of R/W costs on electric utility operation, and current methods that help reduce expenses are among the featured topics slated for the second Right-of-Way Meeting for electric utilities. The two-day session will be held in Chicago, Ill., March 6-7.

Other areas of discussion include effective appraisal practices, training R/W personnel, solution of public relations problems, and the outlook for EHV effects on R/W procurement.

Among the speakers will be Richard H. Taylor, chairman of the American Right of Way Association, and director of real estate and right of way for Detroit Edison Co.

Sponsored by Electrical World, the session will devote two afternoons to roundtable discussions of payment policies, valuing rights, impact of the highway program, and the topics mentioned above.

Registration is $30. This includes copies of proceedings, a luncheon and a social hour. For information contact R/W Editor, Electrical World, 330 W. 42nd St., New York 36, N. Y.

Merger Proposal Okayed By Southern Utah Power

A proposed merger of Southern Utah Power Co with California-Pacific Utilities Co has been endorsed by the Utah firm. Its board of directors voted Jan. 9 to recommend the merger to stockholders on the basis of two-thirds share of CPU for one share of Southern Utah common stock.

Under the plan, which CPU advanced, California-Pacific would be the surviving company. Combination of the two utilities would form a company grossing over $10 million with about 67,000 customers in 70 communities.

Tandem Trucks Team Together for Twisting Timber Trip

Adapting an old hook-and-ladder fire truck technique, Washington Water Power Co smoothly handled a long haul of long poles for its Cabinet transmission line river crossing structures.

Poles are placed in racks on two trucks which the drivers operate in tandem. The method is used by lumbermen on the coast to haul long Douglas firs.

Toughest part of the 110-mile trip came on the twisting Lewiston grade (above). Highway patrolmen blocked traffic for this torturous thirty minute descent.

This load included three 110-ft poles, five 100-footers, and two of 90 ft. The supplier, B. J. Carney Pole Co of Spokane, said they were the longest poles hauled by road in the history of the firm.

The poles are being used in special river crossing structures on the Snake River near a new South Lewiston distribution substation. One crossing carries a 110-kv circuit; the other, a 13-kv circuit.

Low Water Flow Plagues Bonneville Interruptibles

The second of eight Kaiser Aluminum & Chemical Corp potlines was shut down at its Mead, Wash., reduction plant late last month. The closure eased a struggle Kaiser has in common with 16 other Northwest electro-process firms in a season of low Columbia River flows.

Bonneville Power Administration first cut its interruptible load—normally totaling about 500 Mw—on Sept. 30. Customers had the option of using provisional power provided by drawing on storage at Hungry Horse Dam in Montana. This requires replacement, though, if Hungry Horse pool fails to fill sufficiently to supply winter firm requirements.

BPA interruptible was restored for two weeks in October. Since then it has been an on again, off again proposition. While BPA has only been able to supply 17% from the system in the '56 fall and winter draw-down season, about 53% of '56 interruptible load has been supplied this season from all sources.

FPC Reports 486 Mw Net Capacity Gain

PLANT ADDITIONS DURING SEPTEMBER

State	Utility	Plant	Fuel	Capacity
Colo.	Public Service Co of Colorado	Cameo	S	22,000
Fla.	Florida Power & Light Co	Lauderdale	S	125,000
Fla.	Starke Municipal Electric Dept	Starke	IC	5,000
Ill.	Newton Municipal Electric Light & Water Works	Newton	IC	1,320
Ind.	Nappanee Utilities Co	Nappanee	S	3,000
Kan.	Central Kansas Power Co	Hays	S	7,500
La.	Boyce Municipal Water & Light Plant	Boyce	IC	300
Mich.	Zeeland Light & Power Dept	Zeeland	IC	2,000
Mo.	Springfield City Utilities	James River	S	22,000
N. Y.	Greenport Electric Dept	Greenport	IC	1,250
N. Y.	Niagara Mohawk Power Corp	Stark	H	22,500
Ore.	U. S. Army Engineers	Dalles Dam	H	78,000
Tenn.	Topoco, Inc	Chilhowee	H	16,667
Tenn.	U. S. Army Engineers	Old Hickory	H	25,000
Utah	Utah Power & Light Co	Carbon #2	S	100,000
Wisc.	Dairyland Power Co-op	Alma	S	54,400
	RETIREMENTS			
Calif.	California Oregon Power Co	Alturas	H	450
Kan.	Central Kansas Power Co	Hays	S	1,000
La.	Boyce Municipal Water & Light Plant	Boyce	IC	90
Ore.	Milton Freewater Electric Utility	Milton Old	H	360
Ore.	Portland General Electric Co	Salem Station	H	125
Vt.	Green Mountain Power Corp	Moretown (8)	H	500

U. S.	Hydro	Steam	IC	Total
Added	142,167	333,900	9,870	485,937
Retired	1,435	1,000	90	2,525
Adjustments Plus	.....	1,500	1,380	2,880
Adjustments Minus	200	.....	.....	200
Net Change	140,532	334,400	11,160	486,092

H—Hydro, S—Steam, IC—Internal Combustion

U. S. Capacity as of October 1—Hydro, 26,686,648 kw; Steam, 97,053,165 kw; IC, 2,500,238 kw; Total, 126,240,051 kw.

The News-Beat

'Flag' Is Up on Tax Returns

The Internal Revenue Service has directed its field offices to "flag" income tax returns of private power companies, according to Sen Estes Kefauver. The returns will be studied in connection with advertising expense deductions.

The Tennessee legislator recently made public a letter on the development from Dean J. Barron, acting director of the IRS audit division. Said Barron:

"This office is now considering a field report on the matter, and a decision as to the deductibility of these advertising expenses has not as yet been reached. However, we have notified our field offices to flag the income tax returns . . . of the participating electric companies to assure that appropriate audit attention is given to the results of the study now in process."

Preference Asked for Oregon

Oregon would become a preference customer of the Bonneville Power Administration if a preliminary initiative petition filed with the state's secretary of state is adopted. The proposal would create an Oregon Power Development Commission to handle resale of power to industrial customers.

The commission idea, backed by labor and farm groups, PUD's, and REA co-ops, would provide for three elected members with authority to develop new energy sources by constructing dams and transmission lines. The body also could purchase federal dam power for resale.

A state agency is needed, said J. T. Marr, Portland labor leader, "because the federal government is not providing adequate power supplies for new industry." Complete petitions with at least 38,514 signatures of voters must be filed by July 3 to put the initiative measure on the November ballot.

Vogel Votes 'No'

Herbert D. Vogel, board chairman of Tennessee Valley Authority, says he is "as a whole" opposed to proposals made by Charles Oakes, president of Pennsylvania Power & Light Co (EW, Dec. 30, 1957, p 48), to end the TVA controversy.

"Some of the things proposed," he said, "are acceptable and things we all agree on, but as a whole it involves hopelessly limiting factors."

Oakes' recommendations include items such as a provision for TVA to pay interest on past appropriations, repayment of past appropriations, payment of taxes equivalent to power companies' taxes, FPC control of TVA rates, and stronger congressional control over TVA.

Vogel believes legislation authorizing issuance of bonds to self-finance TVA expansion has a "good chance" of passage in 1958.

End of 12-to-1 Ratio?

San Diego Gas & Electric Co has filed with the California PUC for rate increases on electric, gas, and steam service. The utility seeks to boost revenue enough to bring an over-all return of 6.55%. The 6.5% return sought in the electric department would require a 16.7% increase in electric rates, the company says.

Over the past 36 years SDG&E has reduced electric rates a dozen times and raised them only once. But a projected earnings study for 1958 shows that without higher rates the rate of return will dip to 4.86%.

Horn Blows Out Lights

Now the fans know why the lights go out at regular intervals in the Hopkinsville, Ky., Sports Center. It's not blown fuses as everyone previously thought. It happens everytime the engineer on the Louisville & Nashville Dixie Flyer toots his horn at a nearby crossing. In times past, the lights blinded the oncoming engineer. Now, by prearrangement, the horn's toot is a signal to douse the lights until the train passes the crossing.

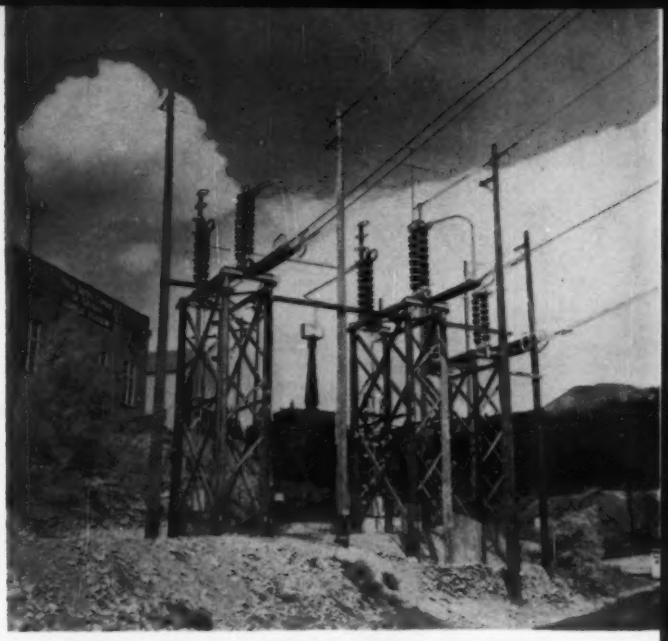
Boundary Line Changes

An agreement signed last fortnight by North Carolina State Utilities Commission and Rural Electrification Administration is expected to smooth disputes over telephone cooperatives' territory and exchange of services with commercial telephone companies. The informal agreement stipulates that REA will notify the commission before giving final approval for formation of a co-op. The commission then will determine, before the co-op begins organizing, whether commercial companies will serve users in the area.

When potential subscribers in either territory seek services of the other group, both the commercial telephone firm and the co-op will discuss the matter. If they fail to agree on the boundary line "crossing," the applicants may take the question to the commission, which will render a decision after a hearing. Disputes on connections or extended area service between co-op and commercial exchanges may also be submitted for a commission ruling.

High-Altitude EHV Tests Begin at Leadville, Colorado

Project of PS Co of Colorado with six manufacturers cooperating starts exploration of future transmission through mountains with special reference to corona loss and radio interference, generated and radiated, and the aging of bundled conductors



TEST TRANSFORMER from Tidd energizes line, partly shown at the right, at up to 500 kv line equivalent

LAWRENCE M. ROBERTSON, Chief Electrical Engineer, Electrical Engineering Dept, Public Service Co of Colorado

The Leadville project has progressed today to the routine testing of a 6,700-ft line at voltages up to 500 kv line-to-line equivalent, two miles above sea level in Colorado's Rocky Mountains. Essentially an extension of American Gas & Electric Co's Tidd tests on corona and radio interference, the project's uniqueness lies in its high altitude, uncontaminated atmosphere, and severe weather conditions.

The Leadville tests were conceived by Public Service Co of Colorado as a means of gathering significant data on:

- Corona loss
- Radio interference, generated and radiated
- Switching surges
- Mechanics of various structure types
- Conductor spacers
- High-country construction and operation.

PS Co of Colorado anticipated the need for long-distance, high-voltage circuits to bring energy from the Rocky Mountains' western slopes or farther to the Denver area. Such lines would traverse high country, much of it at 10,000-ft, and passes at almost 12,000 ft. For accurate economic analysis of alternative voltages and conductor sizes, the utility needed data on corona loss and RI levels at high altitudes and in various weather conditions.

Although laboratory investigations proved that corona and RI levels increase with altitude, published formulas disagreed on quantitative data. The effects of conductor aging and weather variation could be studied better in actual rather than laboratory conditions.

Public Service engineers look to the Leadville tests for confirmation of their view that high-voltage, bundled conductors keep corona loss and RI at economic levels and minimize the effects of wind and ice.

As men work less efficiently at high altitudes and much time is lost transporting them between jobsite and camp, it seemed advisable to minimize the number of structural parts to be assembled. Accordingly, H-frames were preferable to steel towers. Yet both wood and steel are under test to make the findings inclusive.

The line is operated unloaded, but charging current requires about 1,700 kvar at the higher voltages.

A 2,072-ft span was needed over Iowa Gulch, but the other eight spans average under 600 ft, several being half of that. Tensions imposed on all spans, however, simulate those on the long one.

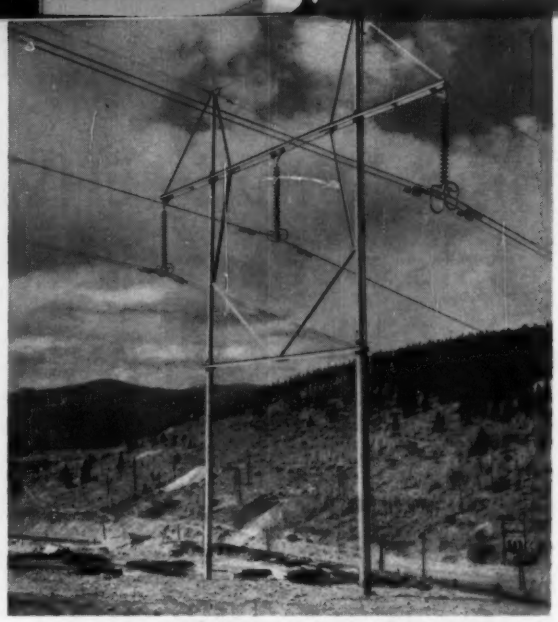
The test substation is adjacent to the Leadville substation where four 115-kv feeders converge, and the test line crosses several of these power circuits. To prevent RI generated by the circuits from affecting measurements, a special 5-pole deadend structure has been erected. This structure supports and provides connections for wave traps for isolating the main line from its parts influenced by the power circuits.

There is one other special deadend structure, which has eight poles supporting the far end of the long span over Iowa Gulch.

Insulators and hardware were designed to afford

These manufacturers participate in the tests by providing equipment, material, and technical assistance:

Aluminum Co of America
Hughes Brothers
Malleable Iron Fittings Co
Ohio Brass Co
U. S. Steel Corp, American Bridge Division
Westinghouse Electric Corp



CORSET-TYPE LATTICE STRUCTURE was installed for comparison with wooden H-frames and unconventional steel-pipe H-frames. The third and fourth cables have been removed from the four-conductor bundle in final use

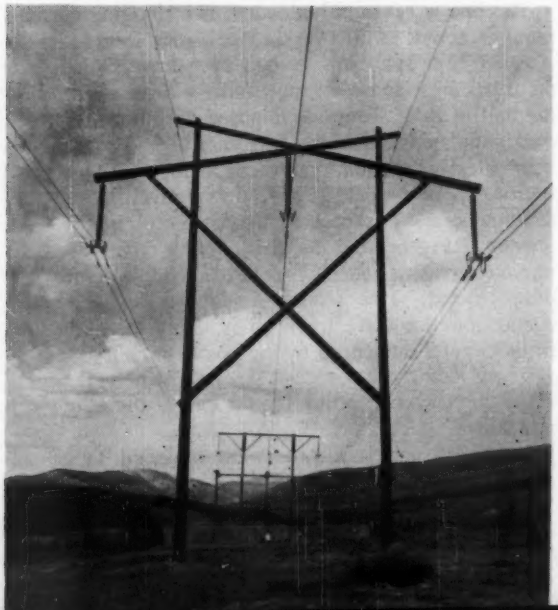
lower corona loss and RI level than the conductors, so that the conductors themselves could be validly appraised.

All three phases are energized in parallel by one single-phase transformer, although this occasions measurement difficulties. Equivalent 3-phase line voltage is not obtained simply by multiplying voltage to ground by $\sqrt{3}$. The criterion for corona and RI is conductor nominal surface voltage gradient. Single-phase operation also makes difficult the analysis of RI data as well as conversion to expected balance 3-phase performance. Tidd results are expected to provide conversion methods.

Tidd accumulated corona and RI data on a single 1.65-in. expanded ACSR conductor and a duplex bundle of 0.92-in. hollow copper conductors. So that Tidd findings could be extended to the high-altitude tests, conductors of the same diameter were installed on two Leadville phases, whose loss and RI levels, nevertheless, are expected to be higher at 10,000 ft.

The third phase was installed with a four-conductor bundle of 1.40-in. expanded ACSR. This bundle gave essentially zero corona which facilitated wattmeter calibration. Later the bundle was reduced to three and then to two conductors.

MODIFIED SPAR-TYPE STRUCTURE frames the five-pole structure in the background, similar to that shown below



Site Work Starts

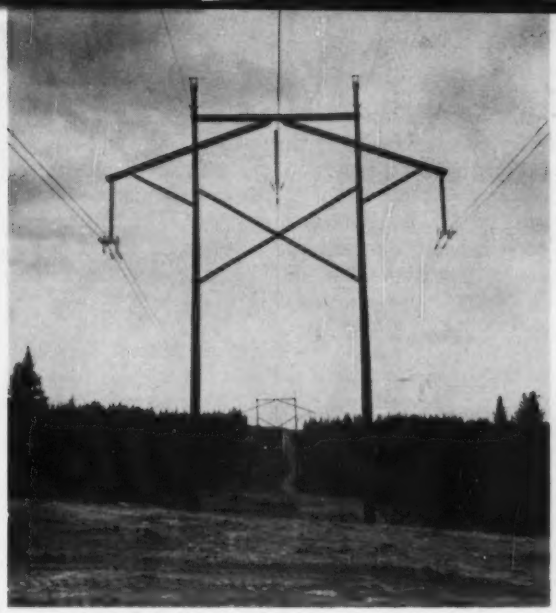
From meager early data, it was estimated that the duplex 1.40-in. arrangement would provide lower corona loss and RI than could be justified for ultimate line construction. But data on 0.92-in. and 1.40-in. duplexes would then straddle the most economic size and permit selection by interpolation rather than by extrapolation.

Site work started in Oct. 1956 with the building of foundations for the transformer, arresters, and circuit breakers. RI meters are enclosed in fiber-glass houses, and there is a trailer-mounted 330-kv coupling capacitor for use in taking generated RI measurements.

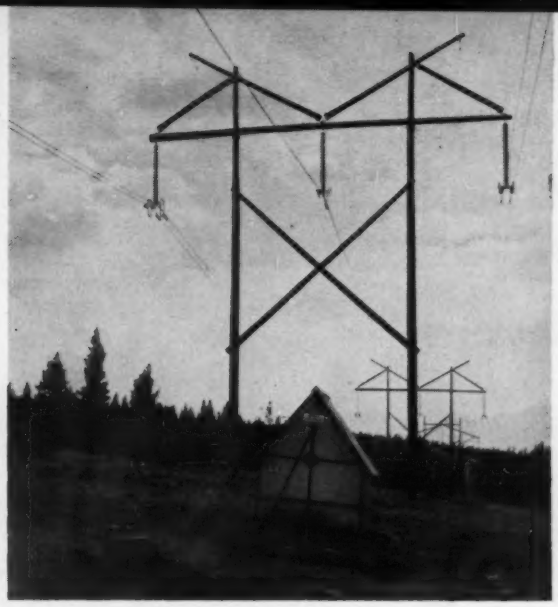
The test station has a receiving rack for the 45/90-kv supply leads, the transformer, a high-voltage, all-welded aluminum bus, motor-operated HV disconnect switches, lightning arresters, and a takeoff structure for the line. Because of the cramped space, the east line disconnect is offset from the other two.

Test substation structures are wood rather than steel to permit economical salvage. The station provides Public Service's first experience with the arc welding of aluminum bus tubing, which was the basis of a complete generating station transmission yard built subsequently.

Wooden H-frames were assembled on the ground and set by cranes and A-frames. Bulldozers backfilled the holes, and earth was tamped solidly around the pole butts. Steel erection was the usual sort. Soft



STANDARD TIMBER H-FRAME was among various structures for the test installation. Small house in the right photo encloses the receiving equipment which is used in measuring radio interference, generated or radiated



ground, found even in this rocky country, required temporary V-guys for tangent-pole support during settling. Having wood guy insulators, they were later short-circuited by guy wire for other tests.

Wood-structure insulator supports were bonded together and grounded. Later all but those on the substation and last structure, will be removed to test their effect.

Normal Test Sought

When the structures were ready, stringing blocks were hung, and conductors were pulled in, the wire being kept off the ground by railroad ties. As test engineers wanted a normal test, no special precautions were taken to prevent scouring and nicking of conductor strands. Both duplex conductors were sagged together, marked, and clipped. The four-conductor bundle, initially installed on the east phase, was treated as two duplexes. Horizontal mid-span spacers were installed, but the vertical spacing was left to be taken care of by the sag.

Spacers are at least 200 ft apart, only one spacer per duplex in most spans. Where practicable, an A-frame held a single pole erect under the span while a lineman climbed to afix the spacer. To install a deep-span spacer, a lineman was drawn along the span in a dolly by ground lines. The dolly was several inverted stringing blocks rigged together. Two types of spacers were used, both found to be satisfactory so far.

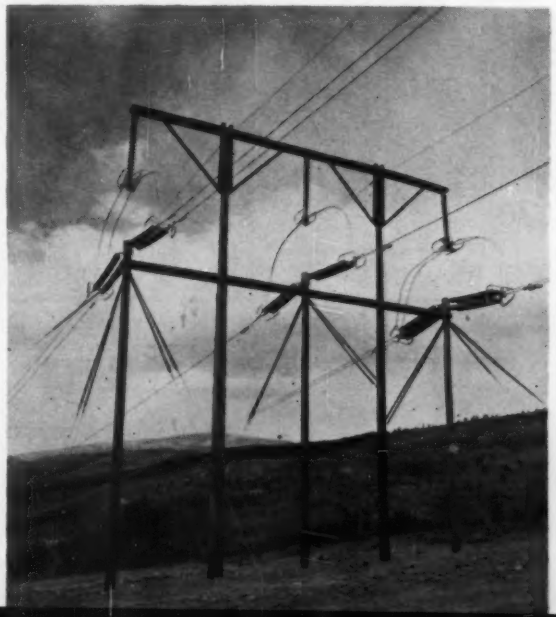
Two houses for the RI-measuring "receivers" are of fiberglass which doesn't attenuate the RI signal. Two are between phases, and the third 200 ft from the line where it simulates a dwelling near the right-of-way. Position along the line was determined by finding a peak point for the RI 1-mc standing wave component. Direct-burial cable carries the RI signal back to the substation and provides instrument and space-heater power. The system was first energized Nov. 19, 1956.

The test transformer has high and low-voltage no-load tap changers, affording 25 tap combinations for 153 to 289-kv output with 69-kv supply. Four type OW 1,500-kva transformers rated 45/90-2.3/6.9/13.8-kv are paralleled on 13.8-kv connections and energized by a 115-13.8-kv, 3,333-kva spare transformer for the Leadville main bank, which is thus isolated from distribution circuits. Copper links in fuse clips are switched to provide either 45 or 90 kv to the test transformer. With 90-kv connection, taps are restricted to prevent test transformer overvoltages.

Both high and low-voltage switching is available. Motor-operated 330-kv-rated disconnects in each test line phase permit energizing one phase alone for RI measurments. An open phase is grounded automatically by the disconnect switch.

After routine checkout of switching operations in

FIVE-POLE STRUCTURE supports radio-interference traps for blocking out commercial powerline-generated RI



LINEMAN on dolly made of inverted stringing blocks is moved out on conductors over gulch to install spacers

LINEMAN climbs on A-frame-supported pole to install conductor spacer on duplex bundle in shallower span

December, the test crew began two jobs it hoped to complete quickly. The first was taking sufficient RI measurements on the yet unaged conductors to establish a reference level from which to gauge aging; the other calibration of the test wattmeter, using the corona-free four-conductor bundle to get a zero reading. Tension on this bundle was 24,400 lb at 0F without wind or ice loading. It was hoped to drop the bottom two conductors before storms brought ice.

But first measurements were perplexing: Readings seemed wrong and were not repeatable. Analysis revealed the presence of a strong fifth harmonic frequency. Two generators at Shoshone Hydro Plant, not equipped with amortisseur windings, were generating a small fifth harmonic which was resonating with the inductance and capacitance of the test circuit. This harmonic had to be trapped before operations could continue.

A fifth-harmonic filter of capacitors and tuned choke coils was connected across the test transformer input on an insulated platform in the substation. Not until mid-March was the trouble located and analyzed, and the filter designed, installed, tested, and tuned.

Meanwhile winter brought 4 to 5 ft of snow, the test conductors getting ¼-in. of radial ice. As anemometers were not installed, total tension is unknown but line and structures held.

Two ten-pen recorders were connected during winter for complete handling of all project data. One records weather data—wind direction and velocity, barometric pressure, relative humidity, ambient temperature, high-rate precipitation, and (by resistance element) internal temperature of a conductor sample. The other records test line watts, volts, amperes, RI level at each of three RI shacks, wattmeter scale, which conductor is energized, and low-rate precipitation.

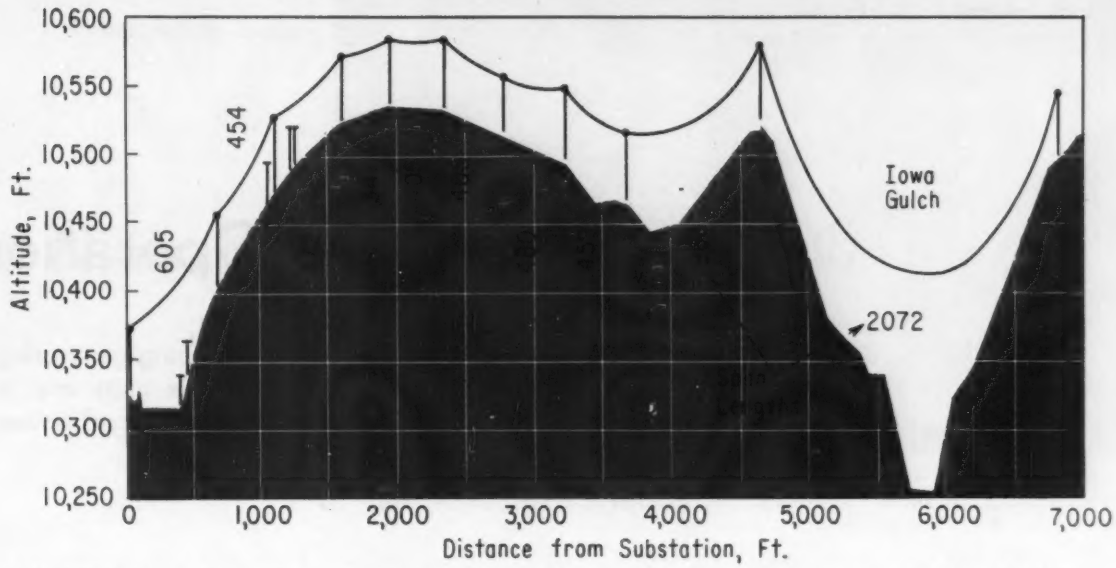
A movie camera was trained on a cluster of material, including an insulator and the conductor sample, where precipitation was easily visible. This camera also recorded smoke or fog in the sky background.

RI Measured Successfully

When instrumentation was hooked up and the filter adjusted, initial RI measurments were made successfully, and wattmeter calibration was begun. As at Tidd, a torque-balance device converted ac watts to a dc signal, giving necessary accuracies at the line's virtual zero pf.

As recorders have insulation problems, the Leadville voltage signal is derived from a separate potential winding, requiring a completely new calibration approach compared with that at Tidd. Special coils were designed, wound, and tested for compensation networks correcting phase shifts of potential winding leakage reactance and instrument case eddy current losses. An automatic wattmeter range-changer was designed and installed. Voltmeters and ammeters in the Tidd birdcage atop the transformer HV bushing were checked for later calibrating use.

After calibration, an automatic program of phase switching was set up. Although only one phase could be energized during RI measurements, all phases were kept energized as much as possible to gain aging time. The automatic program energized each phase 50 min of each hour, the 10 min dead time allowing RI measurements on the other two phases.



LINE PROFILE shows ten structures supporting the 6,700-ft test line. Only one span, over Iowa Gulch, is 2,072 ft

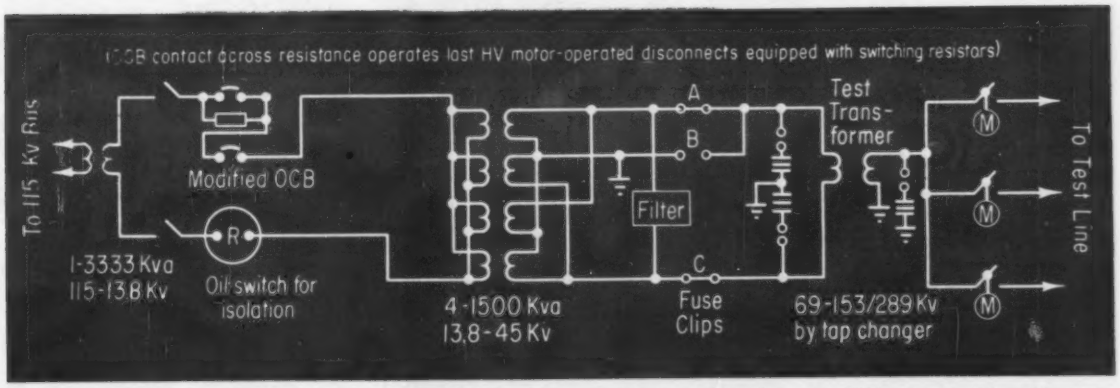
Automatic switching was by low-voltage oil-immersed switch in one 13-kv power input lead, standard reclosers serving as protection in both 13-kv legs. The HV voltage disconnects automatically switched line phases while power was off. But the HV lightning arrester registered switching surges.

On one closing operation, a surge flashed over 6 ft from an insulator deadend on the wave trap deadend structure to a downguy. Wood strain insulators were therefore inserted in the downguys. An oil circuit breaker, modified to insert resistance during switching, was placed in one leg of the 13-kv circuit. The reclosers were removed, and the oil switch was left in the other leg for isolation only.

Between line tests in July, engineers began to pulse the line with square waves to get data furthering RI theory. But the HV arrester, used originally at Tidd, developed a cracked insulator, probably resulting from unanticipated mechanical forces. This afforded opportunity of returning it to the factory for inspection and rebuilding, using latest design of valve elements and gap assemblies.

One conductor was removed from the four-conductor 1.40-in. bundle, and the other lower conductor was centered to give a roughly equilateral three-conductor bundle. When RI and corona measurements were made after the arrester's replacement, the bundle was reduced to its final two-conductor arrangement.

With full test measurements under way, automatic programming was modified to high-side switching alone to save repetitive duty on the OCB. The HV arrester, however, continued to indicate switching surges sufficiently severe to operate it. In September, special resistors were installed on the disconnects to add resistance in three steps during arc interruption. This measure reduced surges and stopped arrester "counts." Oscillographs and recording equipment, installed recently, take switching surge data. **End.**



TEST TRANSFORMER is energized at 90 kv with links in clips A and C and 45 kv in clips B and C. Tap changer is restricted to hold voltage to 289-kv to ground or about 500 kv line equivalent on high-country transmission

DR OTTO HOLDEN, Chief Engineer, The Hydro-Electric Power Commission of Ontario, Toronto, Canada

3 Pump-Turbines in Operation

Ontario Hydro's Sir Adam Beck pumping-generating station will be among largest when all six units are in service; pumped storage has cost edge over thermal power

The first three pump-turbine units are in operation at Ontario Hydro's Sir Adam Beck pumping-generating station. Presumably it will be the largest of its type when all six 46,500-hp units are in service. This plant will pump water from the forebays of the Sir Adam Beck generating stations 40 to 80 ft into a man-made reservoir and later will discharge this water into the same forebay for use in the 1,592,000-kw, 290-ft-head Sir Adam Beck generating station.

Before 1950 the power plants at Niagara Falls were permitted a fixed diversion of water for power purposes, and such diversion resulted in a variable flow over the Falls. This situation was altered by the International Niagara Diversion Treaty (shortened title) which was ratified by Canada and the United States that year.

This treaty stipulates that, subject to the construction of remedial works "to preserve and enhance the scenic beauty of the Niagara Falls and River," the flow over the Falls must not be less than 100,000 cfs during the daylight hours of the tourist season, April 1 to Oct. 31. At all other times, the flow must be 50,000 cfs. Water in excess of these amounts may be used for power purposes.

Sir Adam Beck-Niagara Pumping-Generating Station Statistics

Location	—On the Niagara River, 4 miles down-stream from Falls
Dyke	—Type: clay blanket rock fill Perimeter: 24,300 ft Maximum height: 65 ft
Reservoir area	—750 acres
Storage	—15,500 acre-ft
Headwater elevations	—Max 625 Min 600
Tailwater Elevations	—Max 560 Min 538
Type of Units	—Variable-pitch Francis-type reversible pump-turbines
Number of Units	—6
Pump Turbine	
Rated as turbine (each)	—41,000 hp at 80-ft head
Rated as pump (each)	—46,500 hp at 80-ft head
Best overall cycle efficiency	—74%
Motor-generator	
Rated as motor	—55,000 hp, 13,350 v, Pf 100%
Rated as generator	—31,000 kva, 14,000 v, Pf 95%
Frequency	—60 cps
Speed	—92.3 rpm

Pumped Storage Studied

Immediately upon ratification, Ontario Hydro proceeded with its 12-unit, 900,000-kw Sir Adam Beck No. 2 installation situated adjacent to the No. 1 plant to make use of the increased diversions. Variable flow, it was realized, would seriously limit the dependable output from these plants because it was impossible to provide adequate forebay capacity. This realization led to detailed studies on a pumped storage scheme and to a comparison of pumped storage with new thermal capacity.

Although peak-load demands occur in December, the Canadian daytime entitlement in October is 25,000 cfs less than in December.

at Niagara

AIR VIEW **shows Sir Adam Beck No. 1 and No. 2 plants in foreground, and pumping-generating station on reservoir which is operated from the No. 2 control room**

Representing 550,000 kw, it exceeds the present differential between October and December loads. Thus the former is the critical month.

Studies sought to determine the increase in system load-meeting capability realizable through optimum use of pumped storage for October and December. The studies extended to the installation of additional units in the Sir Adam Beck No. 2 plant solely for peaking duty. The authorized units and No. 1 plant could use the capacity flow through the tunnels and canal.

Lower Capital Costs

The pumped storage plant at Niagara and the four additional units in Sir Adam Beck No. 2 will raise the system's load-meeting capability in December by 526,000 kw and in October by 770,000 kw. In the short-term picture, there will be additional savings through the transfer of surplus nighttime hydraulic energy to higher valued daytime output. This will be accomplished at a slightly lower capital cost than it would be through an equivalent thermal power. Annual charges will be considerably less also.

Storage capacities between 8,000 and 22,000 acre-ft, with a range of pumping-generating capacity for each, were considered. Storage of about 15,500 acre-ft, with a 25,000-cfs pumping capacity, proved most desirable. It was recognized that, in time, load growths would provide enough nighttime load to absorb the nighttime output of all hydro plants. The pumped storage scheme would then furnish short-term peaking capacity, a smaller reservoir sufficing. The reservoir's area was fixed in advance at 750 acres by the land available.

Choice of the pump-turbine capacity was dictated by another requirement: The units had to fill the storage reservoir in 7½ hr. Load curves showed that the low-load night period lasted about 8 hr, and a one-half allowance was made to provide time for starting and stopping the units.

The major portion of Ontario Hydro's resources in the short term were hydro. Accordingly, it was realized that under low-flow conditions the load-meeting capability of these resources would be impaired seriously by a lack of daily energy, even though the peak capability was adequate. Studies showed that under low-flow conditions the justifiable additional installation at Sir Adam Beck No. 2 would be four units with the pumped storage plant in operation.

Consideration was given to installing these units in a new powerhouse downstream from Sir Adam Beck No. 1. There they could take water directly from the pumped storage reservoir and discharge it into the river. This appeared less desirable than the units at Sir Adam Beck No. 2.

Pump-turbine units with the largest possible capacities were desired. Earlier developments limited the capacity of Francis-type reversible pump-turbines. As a turbine, it was limited to about 30,000 hp, and as a pump to discharging about 3,200 cfs under a head of 80 ft. It required a 36,000-hp motor. Extensive research by the English Electric Co, Ltd., produced a new adjustable-blade, diagonal-flow unit of 46,500-hp pumping capacity and capable, as a turbine, of discharging 5,350 cfs at the 80-ft head.

The ability to adjust or "feather" the blades makes operation completely flexible, permitting selection of a broad range of powers or discharges under various head conditions, all at relatively high efficiencies. The runner blades, extending from the hub at a downward angle of 45 deg, are actuated by a vane-type, oil-operated servometer in the runner hub. The blades permit complete closure.

Wicket Gates Eliminated

The close tolerance between the blades and hub, and between the blade tips and the spherical-shaped runner envelope, afford a reasonably water-tight closure. Such closure eliminates the conventional wicket gates and operating mechanism. As the blades can be feathered to the closed position before starting, resistance of the runner in the water is kept to a minimum.

The pumping-generating station incorporates the first modified outdoor type of powerhouse built by

NEW PUMPING - GENERATING STATION dispenses with conventional superstructure and has much of its equipment below the deck which serves as a traffic roadway

Ontario Hydro, elimination of the superstructure resulting in considerable savings. The two erection bay hatches and the six unit hatches are protected at deck level by movable split-type steel covers which roll open on rails. These are easily handled by two men.

A 175-ton "housed-in" gantry crane runs the length of the powerhouse, lifting and transporting all major parts to and from the erection bay below deck level at one end of the powerhouse. The crane completely encloses the unit area when unit hatch covers are open.

Units are so placed that what would be the generator floor in a conventional plant is here the roof deck. At various levels below it, internal access is provided to all parts of each unit for inspection and maintenance. It serves also as a traffic roadway. In this plant without superstructure much equipment is on the lower floors, which open directly into the erection bay.

15,500 Acre-Ft Reservoir

The reservoir is almost two miles long and one mile at its widest. It affords about 15,500 acre-ft of storage with a 25-ft drawdown. The dyke containing the reservoir is essentially a rock-fill mass supporting an impervious clay core, a unique design for such an application. It will be filled and emptied daily.

This dyke was preferred to other designs as the most economical, as there were local clay deposits and vast quantities of rock taken from the canal excavation. The main design problem was ensuring a stability that could withstand the large, daily water level fluctuation. Long-term stability depends upon free drainage of the rock fill.

During the dyke's construction, dimensions of the different zones were dictated by the minimum construction requirements for efficient operation, all of which exceeded the theoretical minimum. The dyke varies in height from 15 to 65 ft. Yet for 65% of its 24,300-ft length, height averages 23 ft, and for only 15% 63 ft. On the outer face, the slope is 1.4 to 1; on the inner face, 2.5 to 1.

Remote Control Operation

At its top the dyke is about 14 ft wide, and at its base the width varies from 75 to 270 ft, depending upon the height. The dyke's construction required about 3,000,000 cu yd of material—1,500,000 cu yd of rock fill, 550,000 cu yd of filler material, and 815,000 cu yd of clay for the impervious blanket core.

Normally, the pumped storage plant will be operated by direct-wire remote control from the Sir Adam Beck No. 2 control room. Duplicate starting and stopping controls are at the pumping-generating station where a single attendant is on duty.

For both pumping and generating operations, each unit is started automatically as a motor connected directly to the line. Such starting eliminates synchronizing equipment. Inrush current is about 250% of rated current.

In starting, the operator selects the direction of rotation for either pumping or generating. This positions the switches in the main leads for correct phase rotation and sets up correct connections in any control or protective circuits requiring reversal. The controller is then moved to start, and the unit comes up to synchronous speed without further manual aid.

5 Modes of Operation

A unit on the line and up to normal speed and voltage may be loaded either manually or automatically by remote control from the same control room. It is loaded by opening the runner blades to the angle for the desired operating condition and, as the head is changing continuously, so also must the blade angle change for optimum results. Automatic control equipment regulates the blade angle of all units in accordance with any one of five modes of operation:

1. Maximum discharge
2. Maximum efficiency
3. Maximum power
4. Constant discharge
5. Constant power

All modes, except maximum power, are applicable to pumping and generating, maximum power pertaining to generating only. Under the last two modes listed the desired level of discharge or power can be set by the operator.

Unit discharge computers derive the discharge of each unit from electrical inputs representing gross head and blade angle. Outputs of these computers are used in constant discharge and for recording and totalizing plant discharge.

For maximum discharge, efficiency, and power, non-linear relationships exist between the gross

head and the required blade angle. Computers, incorporating the nonlinear functions, determine from the gross head information the required values of blade angle. Unit blade angles are automatically adjusted to suit.

Reservoir level, unit loads, and blade angles, as well as totalized load and discharge, are indicated in the Sir Adam Beck No. 2 control room, and some of these quantities are telemetered to the load supervisor's office at Niagara Falls and to the system operator's office in Toronto.

River Flow Varies Hourly

Backed by the other Great Lakes, Lake Erie supplies the river, thus stabilizing the long-term flow. The monthly mean flow averages about 207,000 cfs but, owing to a natural rock weir at the river's entrance, there are relatively large hourly variations.

Under the treaty, the tourist season daytime flow over the Falls is 50,000 cfs greater than that at night. Accordingly, the daytime diversion is reduced by a like amount, which is the equivalent of about 550,000-kw loss in generation to both the United States and Canada.

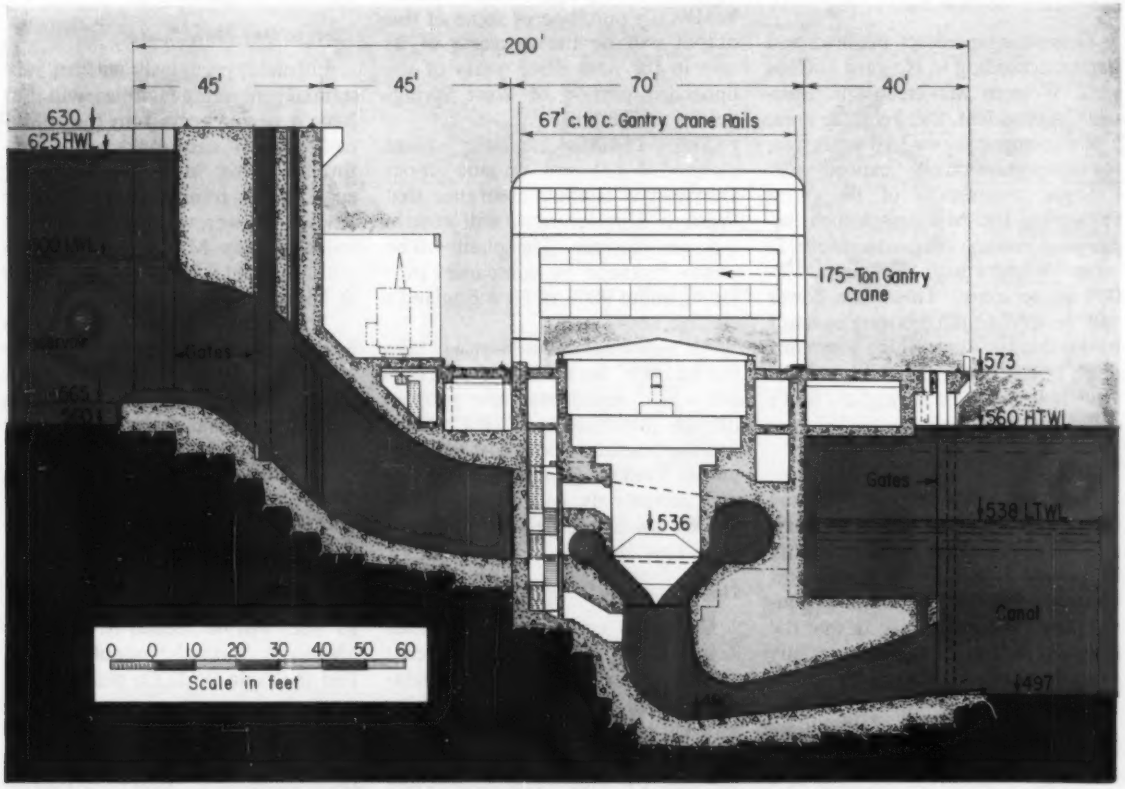
When the United States utilizes its full share of the water available, it will be necessary to match the rapidly varying allowable power diversions from the Niagara River with the requirements of system load. In the studies mentioned pumped storage plant operation was not considered by itself. Instead, consideration was given to the system as a whole, and optimum use was made of all Ontario Hydro's hydroelectric plants and their storages before the pumped storage plant was called upon. The normal method of operation in the short-term period is expected to be as follows:

1. Start operation with the reservoir full at 7:00 AM.

2. In the period 7 AM to 11 PM, release water for use at the Sir Adam Beck No. 1 and No. 2 plants in order that the total output of these units and the pump-turbines meets the system demand on these plants. At time of system peak load, open the pump-turbines wide and load fully all units at Sir Adam Beck No. 1 and No. 2.

3. At 11:00 PM, stop the generating cycle and restart the six units to pump the reservoir full again by 7:00 AM the following day.

Economics will govern operation of the plant, and departures from the normal method of operation will be made whenever outages create loss of capacity or meteorological forecasts predict reduction in diversion. Under this cycle, the peak output from the pumping-generating station at time of system peak demand is expected to be 105,000 kw, compared to a maximum capability, when the storage reservoir is full, of 170,000 kw.



CROSS SECTION of pumping-generating station shows the various water levels in the reservoir and in discharge canal, location of the reversible pump-turbines, and some overall dimensions, as well as the 175-ton gantry crane on the deck

Western Mass. Electric Projects

Envisions developments that will eventually boost distribution voltage and outlay, help area to remain a power exporter

A long-range plan for increasing generation and transmission facilities in western Massachusetts is spurred by the prospect of a doubling of electrical use in four counties by 1970.

Such development will have the effect of gradually raising primary distribution from 4,100 to 13,000 v for serving increased residential loads, including substantial house heating.

Ultimately, each dollar of generation and transmission investment will be matched by about a dollar in distribution outlays, so that a reasonable guess at total construction costs is $100 million.

Has Spare 60,000 Kw

Generating projects planned and begun, according to Howard J. Cadwell, Western Massachusetts Electric Co president, will keep the area, a power-importing one 10 years ago, for many years on the "export" side.

Since completion of the West Springfield 100-Mw Unit 3, the company has enough efficient capacity to serve its entire load and about 60,000 kw to spare. This spare power will be sold to neighboring systems in gradually diminishing amounts until, in late 1960, the utility will be absorbing the West Springfield unit's entire output.

Future Could be Atomic

Even then, WMECo will be long on power reserves, and this situation, coupled with the availability of power from two projects now planned or in the first stages of construction, makes it unlikely that the company will again add substantially to its own generating capacity before 1965.

Whether expansion at that time will be another West Springfield addition, or development of a new site is not now predictable. Nor is it certain whether a new development would generate its steam in a coal-fired boiler or a nuclear reactor.

At Mt. Tom on the Connecticut River, Holyoke Water Power Co has started construction connected with a new plant whose unit will be 137.5 Mw, 37½% larger than West Springfield's Unit 3. The plant will provide much power to be sold to New England Electric System starting in 1960 and to WMECo starting in 1962.

Agreements Reciprocal

Holyoke will have a much more efficient power source than a company of its size could afford to build for its own requirements alone. WMECo's purchase of some of this output will be the converse of its sale in the next three years of the unneeded portion of West Springfield's production.

The 134-Mw nuclear plant planned for Rowe on the upper Deerfield is another assurance that Western Massachusetts will remain a power exporter. This plant will be jointly financed by companies providing about 90% of New England's electric needs.

All New England utilities will take that share of the nuclear plant's output which represents their proportionate investment. WMECo is a 7% participant in both cost and output of Yankee Atomic Electric Co, and accordingly will receive about 10,000 kw of the new unit's output after late 1960.

Closes 115-Kv Ring

Owing to comprehensive earlier development, WMECo's recent transmission outlays have been relatively small. But loads are growing as population shifts, and transmission facilities are planned as new generating plants are built. About a year ago the company closed its high-tension "ring" around Springfield by installing its first 115-kv underground lines and built the large 115-kv Breckwood Switching Station in Springfield.

Having strong NEES connections to the east and west and with Connecticut companies to the south, WMECo had no previous need to close its transmission ring or triangle. But its long-range planning now indicates the desirability of the 115-kv transmission line from Pittsfield to Southwick and through a corner of Connecticut to the north-south transmission system in the Connecticut Valley. The new line will place a 115-kv ring around western Massachusetts.

City to Get New Supply

Pittsfield, previously without substantial generating facilities, will thus have a new supply from the southeast, further assuring service continuity. This line, providing for economical transmission of large blocks of power, will follow for some miles the new Massachusetts Turnpike. The 115-kv switching station at Blandford is built.

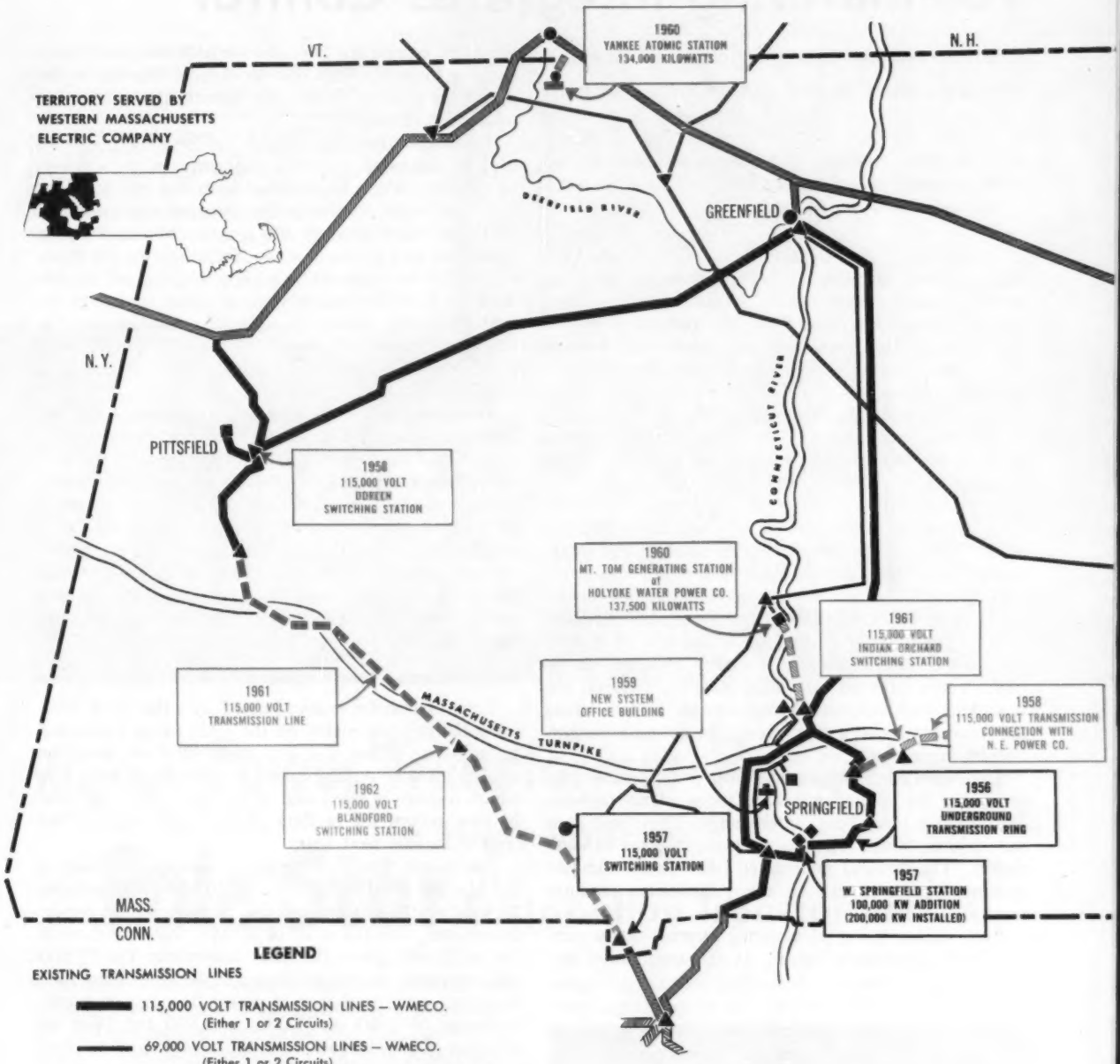
Thus Pittsfield will have lines from three directions, converging in a new 115-kv switching and transformer station, and 115 kv will be transmitted from there to the older Silver Lake Station and thence to General Electric Co.

New Lines Will be Needed

A 115-kv switching station is under construction at Southwick for that area's growing loads. New 115-kv lines will be needed to bring the Mt. Tom Station's output 7 miles into the main WMECo transmission system.

Another connection between WMECo and NEES will run from the company's East Springfield Switching Station to the system's lines in Palmer.

Generation, Transmission Growth



PROJECTED DEVELOPMENT of generation and transmission network in western Massachusetts will get its impetus from the prospective doubling of electrical use in four counties by 1970. Completion of foreseen construction, including subsequent changes in distribution, would run up Western Massachusetts Electric's outlays to $100 million

Telemetering Integrates Control

Existing carrier channel brings in demand readings from remote, unattended stations

L. R. LARSON, Operating and Maintenance Engineer, and R. W. BROWN, Test and Repair Engineer, Interstate Power Co, Dubuque, Iowa

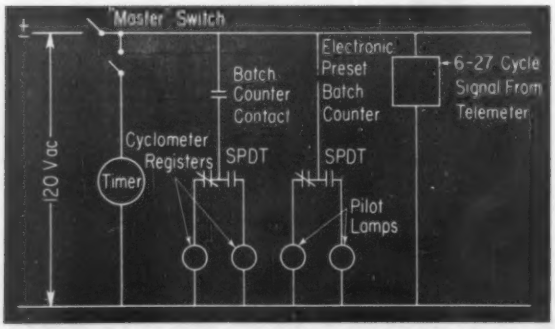
Telemetering over existing carrier-current channels accomplished integration of the automatic load-frequency control system which regulates the net interchange between Interstate Power Co and two neighboring utilities. Such regulation requires hourly demand data from five interchange points, but only the telemetering scheme could bring in interchange demand readings economically from two unattended stations.

Telewattmeter transmitters at the remote stations send signals via carrier to electronic counters in the dispatcher's office, where the hourly demand data are used in calculating interchange regulation.

In exploring several means of obtaining actual demand figures from the unattended stations, Interstate Power found that storage systems with automatic reporting needed additional carrier channels. Otherwise it would be necessary to interrupt the regular telemeter channel periodically. Furthermore the cost of a storage system with automatic reporting appeared to be high. Users reported that integrating registers on the recorders were not sufficiently precise: System swing produced too broad a chart record for accurate integration by inspection.

Two watthour meters fitted with detents meter demands at the interchange substations. One registers "in" and the other "out" interchange. They have contact devices which operate printometer-type demand meters. The demand interval is 1 hr. From attended stations, operators call in the printometer readings regularly.

Each station has a telemetering channel to the central load dispatcher's office. At the unattended stations this equipment is of the variable-frequency type, using a frequency-shift, carrier-current channel to the dispatcher's office. There the interchange appears on wide-chart recorders.



COUNTER CIRCUIT automatically transfers interchange demand reading from one register to the other every hour

The telewattmetering scheme for the remote stations uses no additional carrier equipment and gives results as accurate as can be obtained from any two watthour meters in series. Basically, the transmitter consists of a watthour meter element and a constant-torque motor connected to a common shaft. Serrations on the transmitter disk are scanned by a photo-electric cell to produce the variable-frequency signal which modulates the frequency-shift carrier transmitter. Modulating frequency with zero load interchange is 16½ cps; full scale is 20 Mw. Full scale "in" produces 6 and full scale "out" 27 cps.

To count cycles of modulating frequency per hr, Interstate Power connected an electronic preset counter to its signal input in parallel with the input to the telemeter receiver at the dispatcher's office. The counter is set to close its contacts each 189 cycles of telemeter signal, its impulses being tallied on two electrically operated cyclometer registers. The registers are connected through switch contacts on a telechron-driven program timer in such a way that one register tallies for the first and the other for the second 60 min, the registers alternating thereafter.

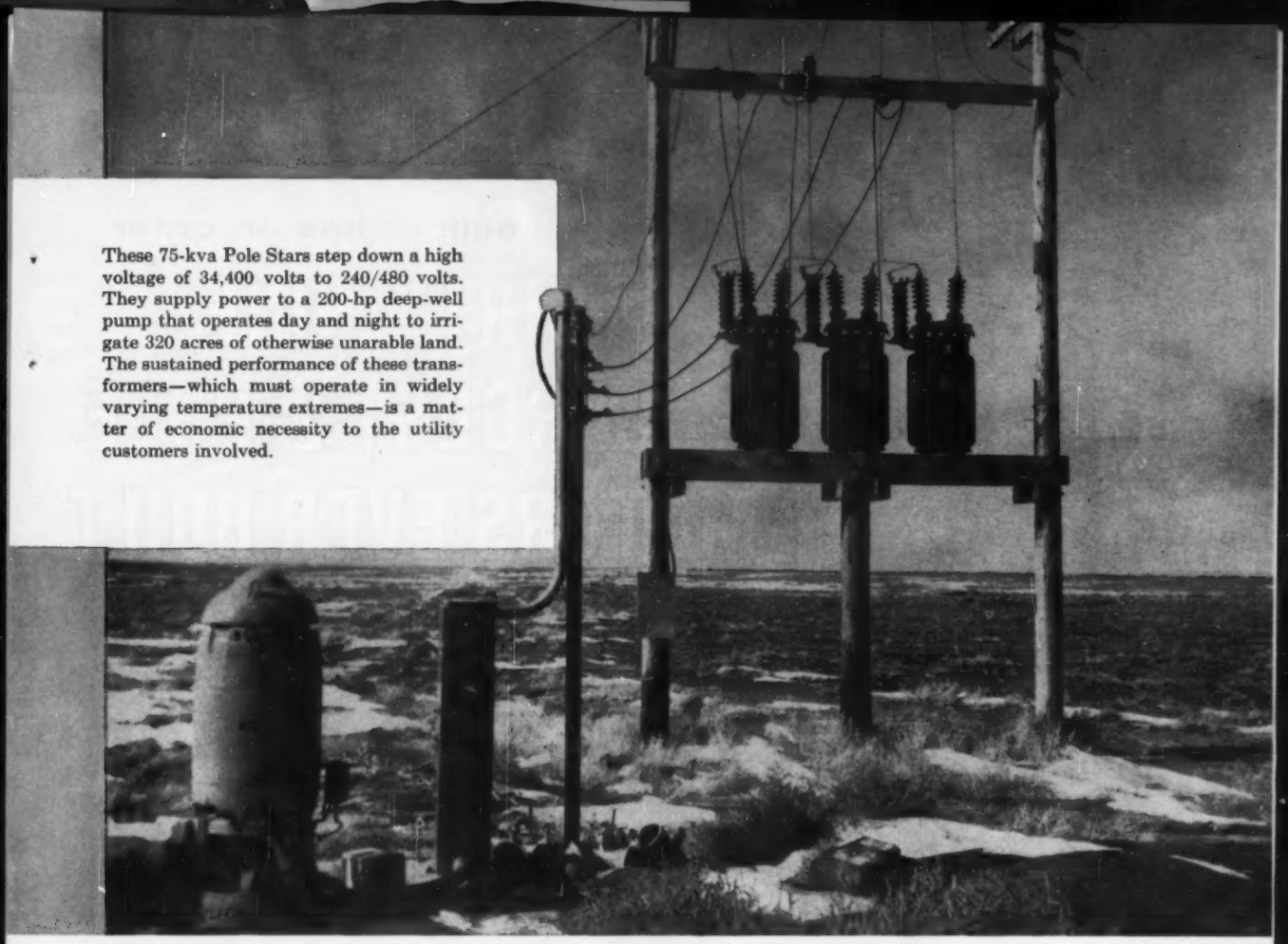
Lamp Indicates Live Register

Time of transfer is coordinated with the clock actuating the printing platen on the interchange substation printometers. Thus the dispatcher need not read the register exactly on the hour. A pilot lamp tells him which register is alive, and at any time after the hour he may record the reading on the other register and reset it for the next hour.

The preset figure 189 gives a reading accuracy of 0.1 Mw per hr. The full scale of 20 Mw "in" produces 27 cps, or 97,200 cph on the frequency-shift carrier transmitter. The full scale of 20 Mw "out" produces 6 cps, or 21,600 cph on the same transmitter. The 75,600 cph represents an energy change of 40 Mw. Thus each megawatt average change in power flow per hr equals a change of 1/40 of 75,000 or 1,890 cph. For an accuracy of 0.1 Mw each hour, the counter is set to close each 189 cycles of the telemeter signal.

Another important figure is 314.2, representing the counts on the cyclometer with zero interchange. Zero interchange results in a frequency of 16½ cps, or 59,900 cph on the frequency-shift carrier transmitter. As the counter is set to close each 189 cycles, it closes 314.2 times per hr for zero interchange.

In practice, the dispatcher finds the difference between the cyclometer count and 314. When the count is smaller, the power flow is "out"; when larger, the power is "in." Actual numerical difference is 10 times the demand in megawatts for that hour, or equal to the demand in tenths of megawatt-hours per hr.



These 75-kva Pole Stars step down a high voltage of 34,400 volts to 240/480 volts. They supply power to a 200-hp deep-well pump that operates day and night to irrigate 320 acres of otherwise unarable land. The sustained performance of these transformers—which must operate in widely varying temperature extremes—is a matter of economic necessity to the utility customers involved.

You Get "Power Transformer Ruggedness" in High Voltage Pole Star Distribution Transformers

With wide experience in the design and construction of power transformers, Pennsylvania Transformer has the specialized knowledge and skill needed to satisfy the rigorous demands of high voltage transformer applications. The internal ruggedness that typifies Pennsylvania's power transformers also is designed into higher voltage Pole Star Distribution Transformers.

For example, the sturdy high voltage lead supports form an integral part of the coil . . . coils have extra bracing top and bottom to protect against possible short circuit forces . . . the core frame is of especially sturdy angle-and-channel construction . . . and tap changers feature power transformer ruggedness in both design and construction.

As a result, high voltage Pole Stars deliver economical, sustained performance in even the most demanding distribution transformer applications. The pictured 34,400-volt installation is a convincing example. For more details contact Pennsylvania Transformer Division, McGraw-Edison Company, P. O. Box 330, Canonsburg, Pa.

McGRAW EDISON

PENNSYLVANIA TRANSFORMERS — POLE STAR

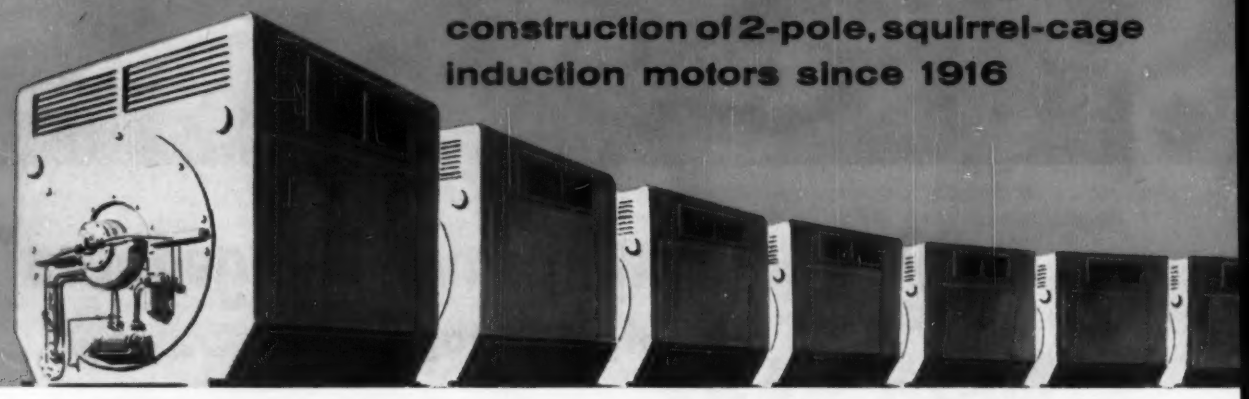
PENNSYLVANIA DISTRIBUTION TRANSFORMERS

AN UNMATCHED RECORD...

ELLIOTT has recently built or has on order 39 of the THIRTY-NINE LARGEST 2-POLE MOTORS EVER BUILT

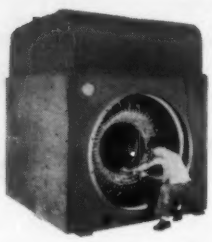
11 motors — each 4500 hp
24 motors — each 5000 hp
4 motors — each 6000 hp

SPECIALISTS in the design and construction of 2-pole, squirrel-cage induction motors since 1916



ONLY ELLIOTT has such a fabulous record-smashing history in large 2-pole motors

Elliott built the first large 2-pole motor in 1916. Since then Elliott has been a leader in building large 2-pole, squirrel-cage induction motors with designs progressively in advance of the power industry's constantly-expanding need for larger boiler feed pump drives. In 1956, Elliott built the first 5000-hp, 2-pole motor, and in 1957 it built four 6000-hp machines (like the one seen on the left)—again the largest of this type ever built—another world's record.

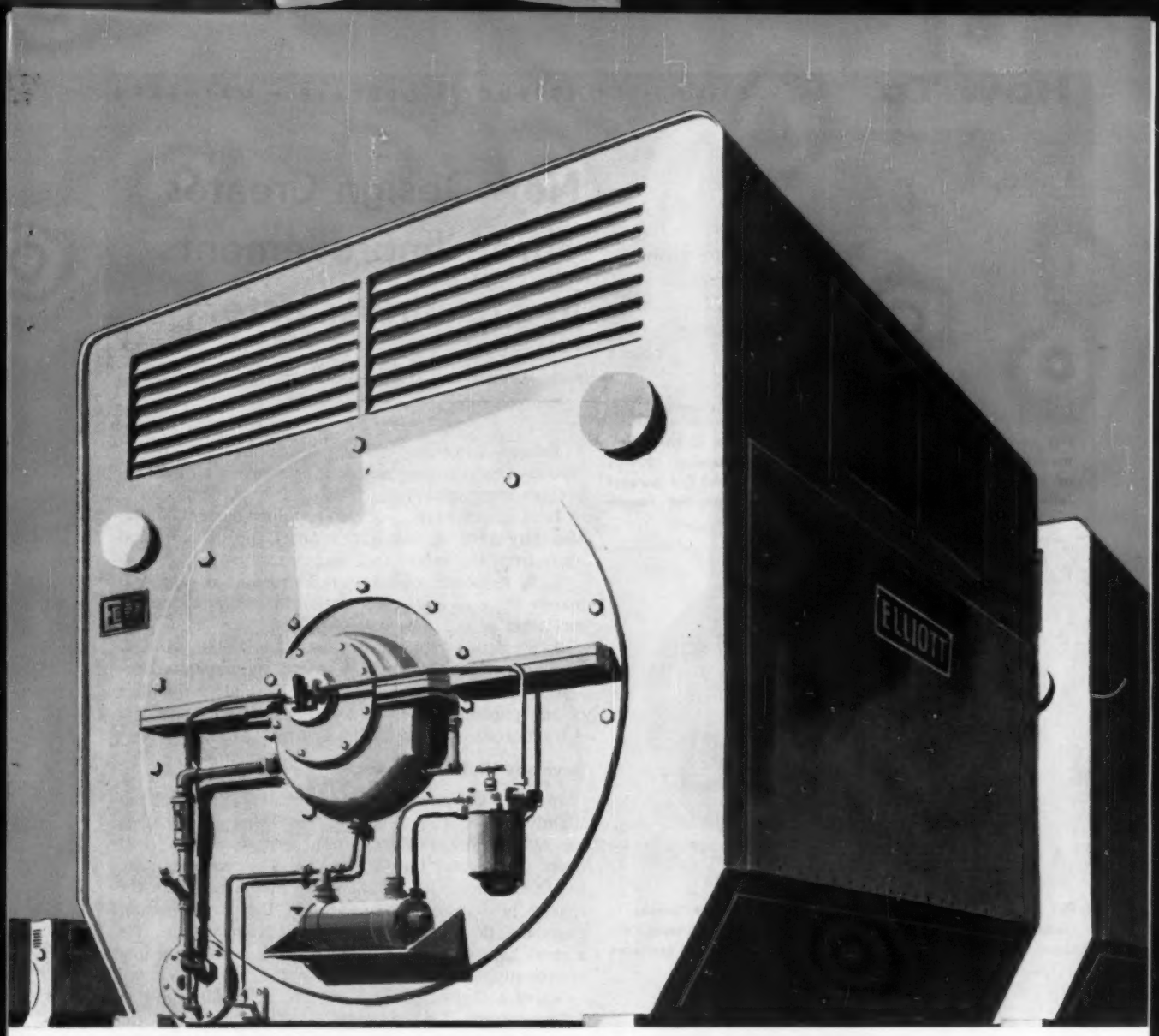


ONLY ELLIOTT has an 8-year field service record without one single operating electrical failure

Since 1948, 1,900,000 hp of large squirrel-cage induction motors with Fabri-Seal insulation have been put into service. The results shattered all previous records. Not one stator coil failed in over 8 years—due to insulation breakdown. Fabri-Seal Insulation combines the best of modern miracle insulations with ageless mica. Fabrication techniques are designed to permanently seal the coil against ravages of moisture, chemical fumes, dirt, etc., protecting your most vital auxiliaries against outages.

ELLIOTT Fabri-Seal INSULATION

Elliott's Fabri-Seal insulation system includes hand-wrapped mylar-backed mica at coil slot sections, special sealing at vulnerable points, vacuum and pressure impregnation of all coils, coil and complete stator immersing, and turn-to-turn testing at high voltages.



ONLY ELLIOTT has consistently pioneered in advanced, superior designs

Elliott introduced Fabri-Steel construction "tailoring in metal" to large 2-pole machines . . . brought out the first *really* outdoor motor which subsequently led to an entirely new NEMA classification—the "weather-protected" motor . . . and consistently fabricated superior stator coil insulation (achieving astounding records of 20, 30, and 40 years of service) even prior to the development of Fabri-Seal insulation, which achieved an 8-year record. In "super-quiet" 2-pole motors also, Elliott was first—following years of research and development in acoustical design problems.

ELLIOTT Company
RIDGWAY PLANT, RIDGWAY, PA.

R8-3

ASK YOUR OPERATING PERSONNEL

They'll tell you it pays to install Elliott-designed machines

Wherever Elliott 2-pole induction motors are on the job . . . operating personnel have expressed pleasure at their dependable, trouble-free service.

Here are typical comments:

"What more could you ask for in a motor."
"The noise level is out of this world."
"Your access openings are better than our fondest expectations."

Try it yourself. Ask your operating man—he'll tell you Elliott 2-pole machines give the best and longest trouble-free service. Call or write for complete details *today*.

get your powerhouse motors from the people who build them best

FIG 1—GAP COMPONENT (this one rated 4.5 kv in station models) consists of 13 Mycalex plates containing 12 sets of spark gaps in series. It stretches the 60-cps power-follow-current arc to 33 in., 140 times original length

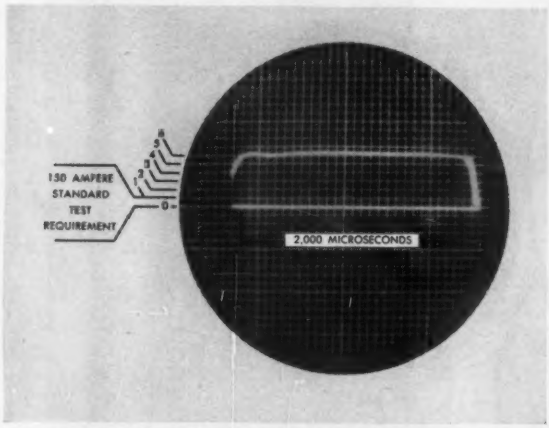


FIG 2—THERMAL DURABILITY of Thorex valve blocks is demonstrated as the gap withstands test current six times the 150-amp standard requirement for 2,000 microsec

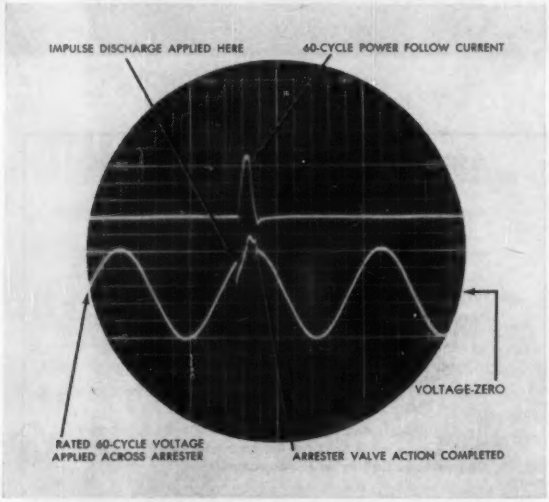


FIG 3—DUTY-CYCLE PERFORMANCE is proved under 10,000-amp lightning impulse discharge. The impulse occurred on voltage rise, near system generated voltage crest, but interruption was complete ¼ cycle ahead of voltage zero

New Design Creates Three Improvements in Station Arresters

PAUL M. ROSS, Manager, Equipment Division, Ohio Brass Co, Mansfield, Ohio

Recent advances in the design of high-voltage station-class lightning arresters now provide three important improvements:

1. A major portion of power-follow-current limitation duty is transferred into the spark gap structure and away from the valve block element.

2. A reduction of arrester dimensions to approximately those of equivalent station insulation by miniaturization of internal parts.

3. Single-unit construction at all voltages, with an accompanying high immunity from contamination damage. This construction utilizes the insulating qualities of the porcelain housing to isolate external leakage currents from internal grading currents.

Develops High Arc Voltage

In a 4.5-kv series gap unit structure with a volume slightly more than 3 cu in., the Dynagap stretches the 60-cps power-follow-current arc to 33 in., 140 times its original length (Fig 1). This extended arc length, coupled with rapid cooling by means of closely spaced heat-absorbing surfaces in the arc-expansion chambers, develops exceptionally high arc voltage. As a result, arc voltage quickly reaches a point exceeding system supply and the arc goes out.

Valve action of the gap element in limiting power-follow-current is so vigorous that it compensates for most of the resistance (up to 98%) once needed in the valve blocks. Now they supply as little as 10% of power-follow-current limitation duty.

Such a transfer of duty away from the valve-block element permits two basic improvements: Use of relatively small blocks that possess high thermal safety factors (Fig 2); and release of many restrictions and compromises in valve block technique that were previously demanded by the dominating requirement of high power-follow-current-limiting resistance.

These design refinements produce a high order of thermal durability to withstand long-duration surges. This is gained without sacrifice of low sparkover or IR discharge voltages.

Extreme compactness of the gap element permits an unusual departure from conventional arrester design —use of identical gap components in distribution, intermediate, and station arresters. This imparts to the lower classes a construction quality formerly associated only with station units.

(*Continued on page* 70)

The Fifty Largest Utilities as listed in the 1957 FORTUNE DIRECTORY
★ American Tel. & Tel. (New York)
★ Pacific Gas & Electric (San Francisco)
★ Consolidated Edison of New York
★ Commonwealth Edison (Chicago)
★ American Gas & Electric (New York)
★ Tennessee Gas Transmission (Houston)
★ Public Service Elec. & Gas (Newark, N. J.)
★ Southern California Edison (Los Angeles)
★ Southern Co. (New York)
★ Detroit Edison (Detroit)
★ Philadelphia Electric (Philadelphia)
★ Niagara Mohawk Power (Syracuse, N. Y.)
★ General Telephone (New York)
★ El Paso Natural Gas (El Paso, Texas)
★ Columbia Gas System (New York)
★ General Public Utilities (New York)
★ Consumers Power (Jackson, Mich.)
★ American & Foreign Power (New York)
★ American Natural Gas (New York)
★ United Gas (Shreveport, La.)
★ Texas Utilities (Dallas)
★ Middle South Utilities (New York)
★ Pacific Lighting (San Francisco)
★ Texas Eastern Transm. (Shreveport, La.)
★ Consolidated Natural Gas (New York)
★ Central & South West (Wilmington, Del.)
★ New England Electric System (Boston)
★ Pennsylvania Power & Light (Allentown)
★ Union Electric (St. Louis)
★ Ohio Edison (Akron)
★ Virginia Electric & Power (Richmond)
★ Peoples Gas Light & Coke (Chicago)
★ Northern States Power (Minneapolis)
★ Cleveland Electric Illum. (Cleveland)
★ West Penn Electric (New York)
★ Duke Power (Charlotte, N. C.)
★ Long Island Lighting (Mineola, N. Y.)
★ Baltimore Gas & Electric (Baltimore)
★ Duquesne Light (Pittsburgh)
★ Northern Natural Gas (Omaha, Neb.)
★ Wisconsin Electric Power (Milwaukee)
★ Transcontinental Gas Pipe Line (Houston)
★ Pennsylvania Eastern Pipe Line (New York)
★ Public Service of Indiana (Plainfield)
★ Florida Power & Light (Miami)
★ Illinois Power (Decatur, Ill.)
★ Western Union Telegraph (New York)
★ [illegible] (Boston)
★ New York State Electric & Gas [illegible]
★ [illegible] Gas & Electric (Cincinnati)
© 1957 Time Inc.
Among the 50 largest utilities, only one electric or telephone utility is a Preformed prospect...
the rest are Preformed customers
In July, 1947, Preformed Line Products Company didn't have a customer; all the electric and telephone utilities were prospects. Today, the situation is almost completely reversed.
For example, in FORTUNE's list of the "Fifty Largest" utilities, only one of the *electric* and *telephone* utilities mentioned is still a prospect; all the rest are now Preformed customers. In other words, the Preformed principle of using preformed helical rods for line accessories has gained almost complete acceptance in only 10 years.
If you are among the few utilities not utilizing Preformed, you might ask "Why?". PREFORMED LINE PRODUCTS COMPANY, 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable Address: Preformed-Cleveland ...in 10 years the leading manufacturer of armor rods, dead-ends, Guy-Grip dead-ends, splices and other line accessories.
PLP
You can look up to Preformed

Kw Capacity GOING UP

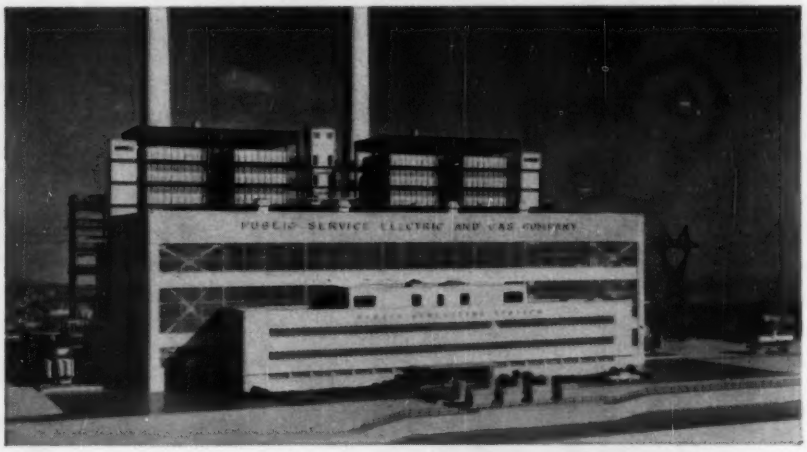
for PUBLIC SERVICE ELECTRIC AND GAS COMPANY

New Bergen Generating Station will add 580,000 kw to The Public Service system— and Units No. 1 and No. 2 will both be served by FW double-furnace reheat steam generators of 1,900,000 lb/hr capacity

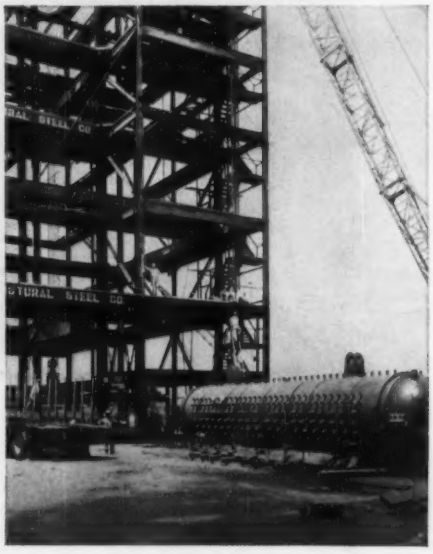
THE GREAT postwar growth of New Jersey's industry and suburbs has placed heavy demands upon the power capacity of Public Service Electric and Gas Company. To keep ahead of this rapidly growing demand, Public Service has embarked upon a construction program which will amount to approximately $345,000,000. An important segment of this expansion program is the construction of the new Bergen Generating Station, in Ridgefield, which will have an output of 580,000 kw — increasing system capacity by 27½% over that of December 31, 1956. The station will consist of two generating units of 290,000 kw each and is scheduled for service in the early part of 1959.

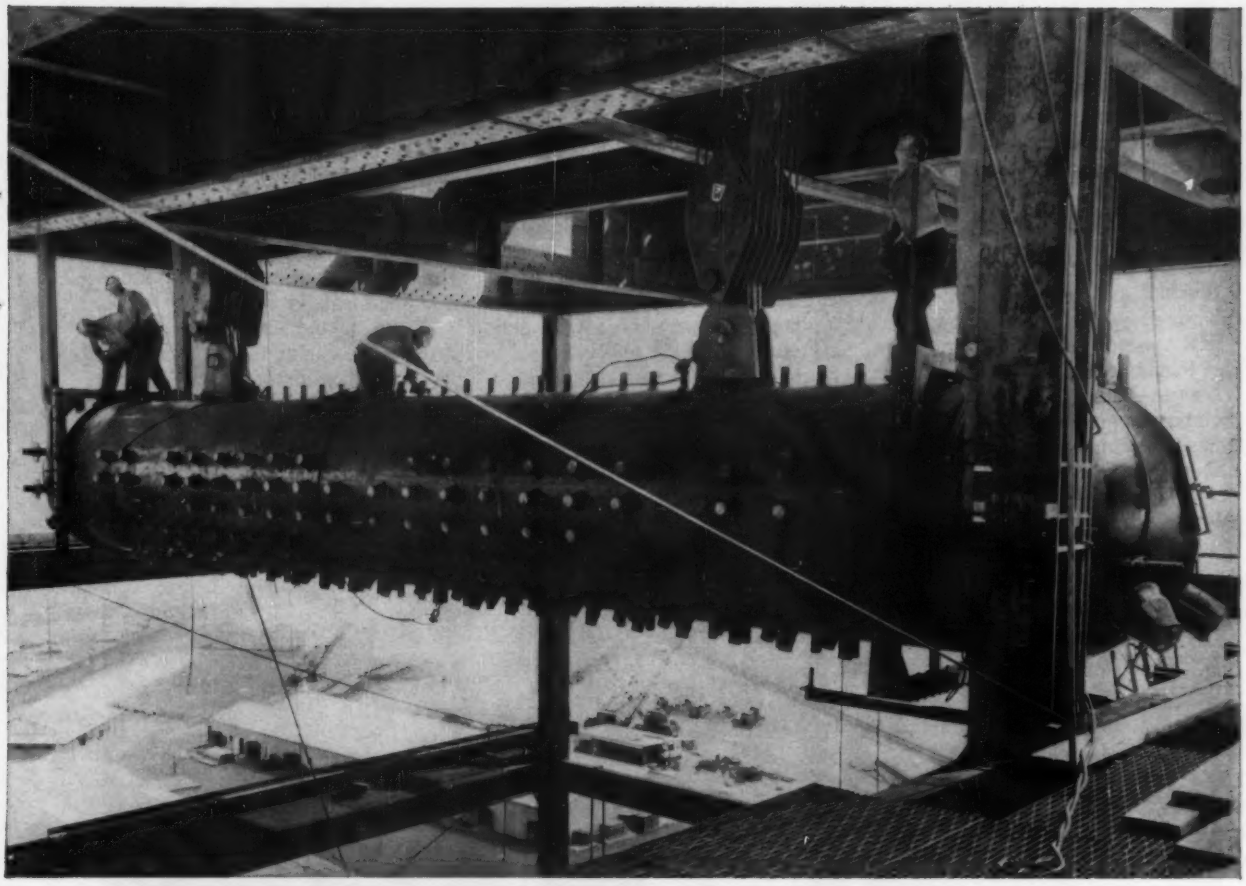
Both units at the Bergen Generating Station will be served by Foster Wheeler steam generators — each generator providing 1,900,000 lb of steam per hour at a design pressure of 2,725 psig. Primary steam temperature will be 1100 F with reheat temperature of 1050 F. The units are of double-furnace, natural circulation design and are fueled by pulverized coal. They are constructed for pressurized operation, utilizing forced draft fans only.

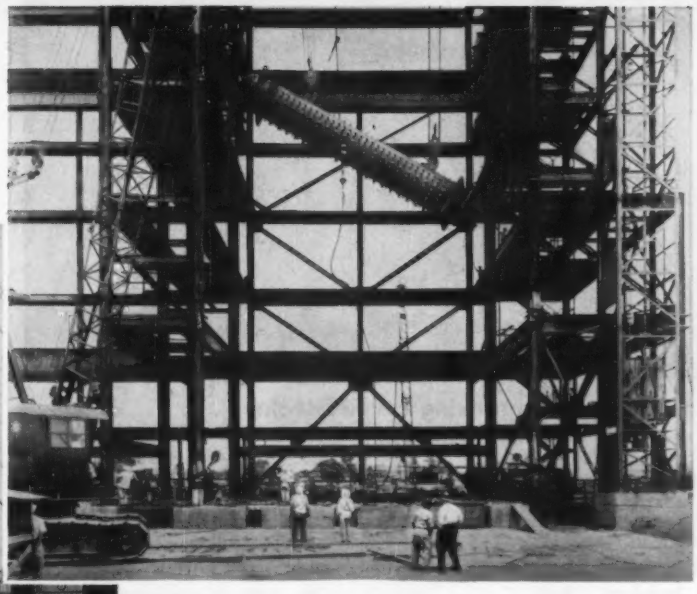
In addition to the steam generators Public Service has also ordered six FW ball mill pulverizers — three for each unit. With capacities of 81,000 lbs of coal per hour each, they are the largest ball mills manufactured by FW to date.

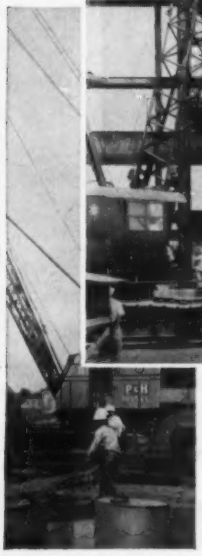


With more than a half-century of experience in steam generation — and the finest modern manufacturing facilities in three large plants—Foster Wheeler welcomes the opportunity to quote on your requirements. You'll receive the same kind of heat engineering experience and service that led Public Service Electric and Gas Company to award Foster Wheeler its part of the Bergen Generating Station.









The photographs at left and above show three stages in the process of hoisting the 125-ton steam drum into erected position in the FW steam generator for Unit No. 1 at the Bergen Generating Station of Public Service Electric and Gas Company. The generator will supply 1,900,000 lb of steam per hour at 2,725 lb/sq in gage design, 1100 F primary steam temperature and 1050 F reheat temperature.

Both of the units at Bergen are expected to go into service early in 1959.

FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

New Arrester Design

(*Continued from page* 66)

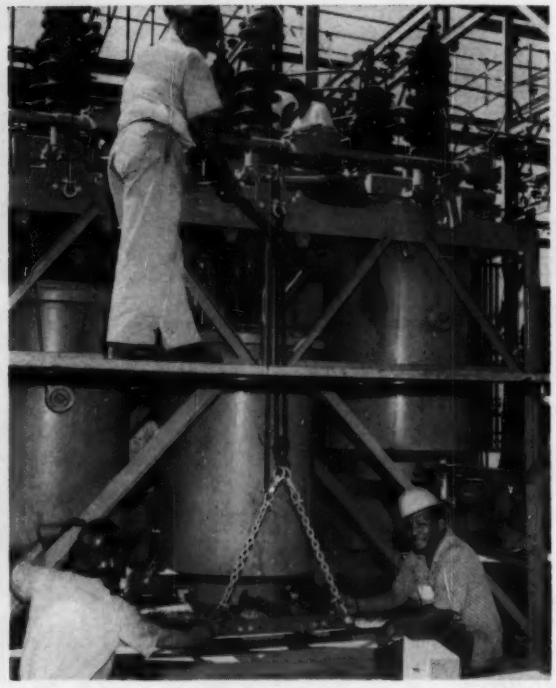
Compactness yields another innovation in station-class arrester design. The reduced dimensions of internal components permit stacking in three physically parallel columns within the 16½-in.-dia porcelain housing. This height reduction permits elimination of individual stacking units and use of a single-unit porcelain housing, a new concept in high-voltage design.

Single-unit housings effectively control contamination damage by eliminating its basic cause. Previous designs employed stacked multi-unit construction to reach the desired electrical rating. End caps of each unit constituted terminals for that unit's internal circuit. These were likewise terminals for the external leakage circuit over the surface of each unit. Under unfavorable conditions of wetted surface contamination, this leakage current is erratic and unpredictable. It is introduced into the sensitive protective circuit at intermediate stack connection points via the end caps. Voltage in excess of rating may, therefore, easily be imposed on one or more units, at which time failure is imminent.

In single-unit construction, the porcelain housing serves to isolate all leakage currents from the sensitive internal protective circuit. These currents merely bleed harmlessly over the surface to ground. Effectiveness of this measure in combatting contamination damage has been proved in single-unit arresters up to 60 kv, which have been used extensively since 1952. Now extended to the highest operating voltages, it eliminates the chance of grading resistor deterioration under long-sustained leakage conditions.

Reducing the size of the station arrester to roughly that of comparable switch-insulator stacks opens the way to convenient and economical location of the arrester within station steelwork, plus economies of unit manufacturing and handling.

Whether moving transformers in vaults . . .



or untanking circuit breakers . . .

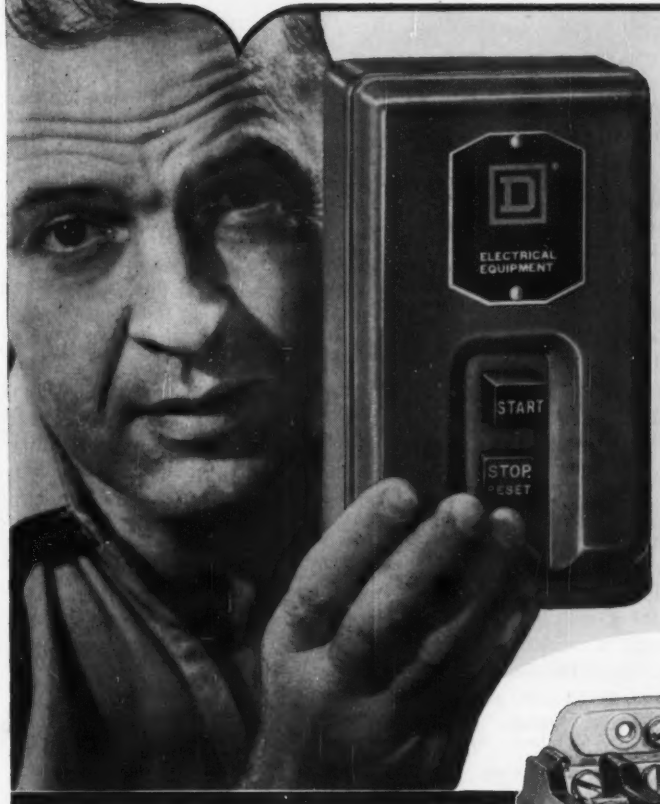
Hand Chain Hoists Cut Maintenance Labor

Hand chain hoists cut the time and cost of handling transformers in vaults and untanking circuit breakers at Hawaiian Electric Co.

Two hoists are used with a steel carrier to move a transformer in a vault. The carrier rides on four large casters and is positioned over a transformer for lifting. When three 4-kv 100-kva transformers were moved into a vault to replace smaller units, the new scheme, used in place of metal skids, cut the time and cost in half.

In untanking a breaker, two chain hoists are used with steel platforms placed under the tank. The platforms are lowered and raised by hoists attached to the breaker structure. This method took 6 min to lower and raise a 46-kv 1,950-lb tank; the old scheme, hand winches and cables rigged on the breaker, took 20 min.

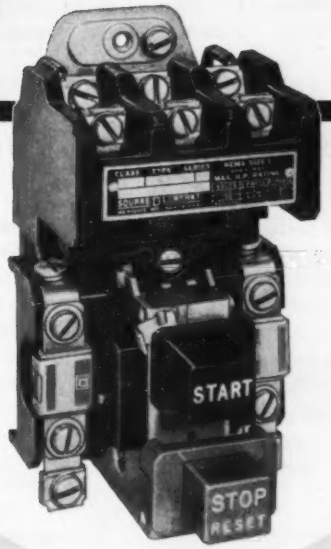
This NEW Manual Starter has EVERYTHING!



NEMA Sizes 0 and 1

Two, three and four-pole construction

- ***SMALLER!*** **Takes less space, whether it's built into machine or mounted externally**
- ***SMART STYLING!*** **Matches the streamlined appearance of today's modern machines**
- ***QWIK-MAKE, QWIK-BREAK!*** **Positive snap-action opening and closing of contacts. Longer contact life**
- ***TRIP-FREE OVERLOAD PROTECTION!*** **Impossible for operator to hold motor circuit closed against overload**
- ***LONGER LIFE!*** ***Toggle Action*** **operating mechanism. Heavy-duty construction throughout**
- ***EASIER INSTALLATION!*** **Wire it without removing starter from enclosure. All terminals have pressure wire connectors**
- ***EASIER MAINTENANCE!*** **"Off-the-Shelf" parts kits make normal maintenance and modifications easier than ever. They're easy to buy, easy to identify, and faster to install**
- ***TAMPER-PROOF!*** **Cover padlocking device prevents tampering by unauthorized personnel. Safety latch locks "start" button in "OFF" position**
- ***VISIBLE INDICATION OF OVERLOAD!*** **Self-centering push-buttons show when overload has occurred**



CHOICE OF ENCLOSURES:

- **Water and Dust-Tight**
- **Hazardous Locations**
- **Flush Mounting**

Write **for BULLETIN 2510 B-C**
Address Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

Selling

'A Family Affair': Westinghouse Cinemaboost to Housepower

'HAM' ACTIVITIES of son (Bobby Driscoll) interest entire family in 'A Family Affair', Westinghouse film illustrating inadequate wiring and promoting full Housepower. Father (Eddie Albert) and mother (Marjorie Reynolds) also star

Westinghouse has come up with a professional, entertaining film designed to boost Housepower. Called "A Family Affair," it is aimed at the broadest possible audience.

"A Family Affair" follows a believable American family of five through several typical days of their lives during which their everyday activities are hampered by inadequate wiring. These run the gamut from a schoolgirl romance to a teenager's hobby. Thus, the family—and the audience—come to realize the need for full Housepower. The film concentrates on the industry-wide Housepower concept; Westinghouse has limited any mention of its name to screen credits at the end.

The cast is a good one. Its stars, among others, are Hollywood's Eddy Albert as the father; Majorie Reynolds of TV's "Life of Reilly" fame as mother; and teenage Oscar-winner Bobby Driscoll.

Almost Anyone Can Use It

The film can be used by almost anyone interested in promoting adequate wiring. Westinghouse reports demand for the show is increasing. Support for it is coming from several industry associations including Edison Electric Institute, National Electrical Contractors Assn, and National Wiring Bureau.

Utility men who have seen "Affair" have nothing but praise for it. Says Georgia Power's Joe Browder: "It is the best commercial film I've ever seen," and Detroit Edison's E. O. George: "It does an excellent job of telling the Housepower story in a very interesting and convincing manner."

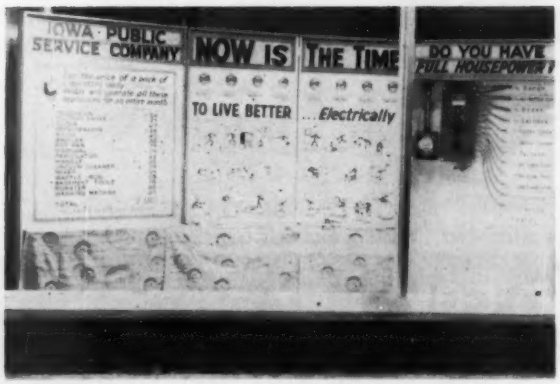
For utilities interested in buying "A Family Affair" . . .

Running time is 24 minutes, and it is full color on 16 mm. It may be bought through Housepower Program, EEI, 420 Lexington Ave., New York 17, N. Y., for the print cost of $150. EEI will also preview it prior to purchase.

Iowa PS Plugs LBE, Housepower with Portable Display

Iowa Public Service Co is using a portable Live Better . . . Electrically—Housepower display to push those two programs throughout its territory.

Measuring 14 x 7 ft, the easily moved display fits conveniently into most store windows. It folds into two neat 4 x 7 x 2-ft packages. Iowa PS estimates two men can move the rig from truck to floor area and have it set up in 30 min.



The display message is divided into three parts. Its left panel gives the customer, in terms he understands, an idea of just what a bargain electricity is. It says, "For the price of a pack of cigarettes daily ($7.80 a month) Reddy will operate all these appliances for an entire month." It then lists the appliances and their respective average monthly energy costs.

The center panel gives the local time and the time in seven cities around the world. It's headed, "Now is the Time to Live Better Electrically." An illustrated Reddy Kilowatt is performing household chores below. The right hand panel features a modern 100-amp service.

Flexibility is another feature. The panels may be used separately or in combination. They are being used at shows, fairs, schools, and meetings. Cost: $340.

(*More Selling on p* 76)

NEW FROM VICTOR!

NO. 961 FOGBOWL SUSPENSION

Specially designed for fog and smog contaminated areas, this brand new product of VICTOR research was created to satisfy a critical need. The new No. 961 suspension has the *lowest* leakage current and the *lowest* radio interference level of any other type or make of fogbowl suspension insulator used in contaminated areas.

Low surge and leakage currents contribute to many desirable advantages of this insulator—particularly the elimination of wood cross-arm burning. These exceptional features have been proved not only in VICTOR'S own electrical laboratory, but by extensive service on lines in locations where contamination is a serious hazard.

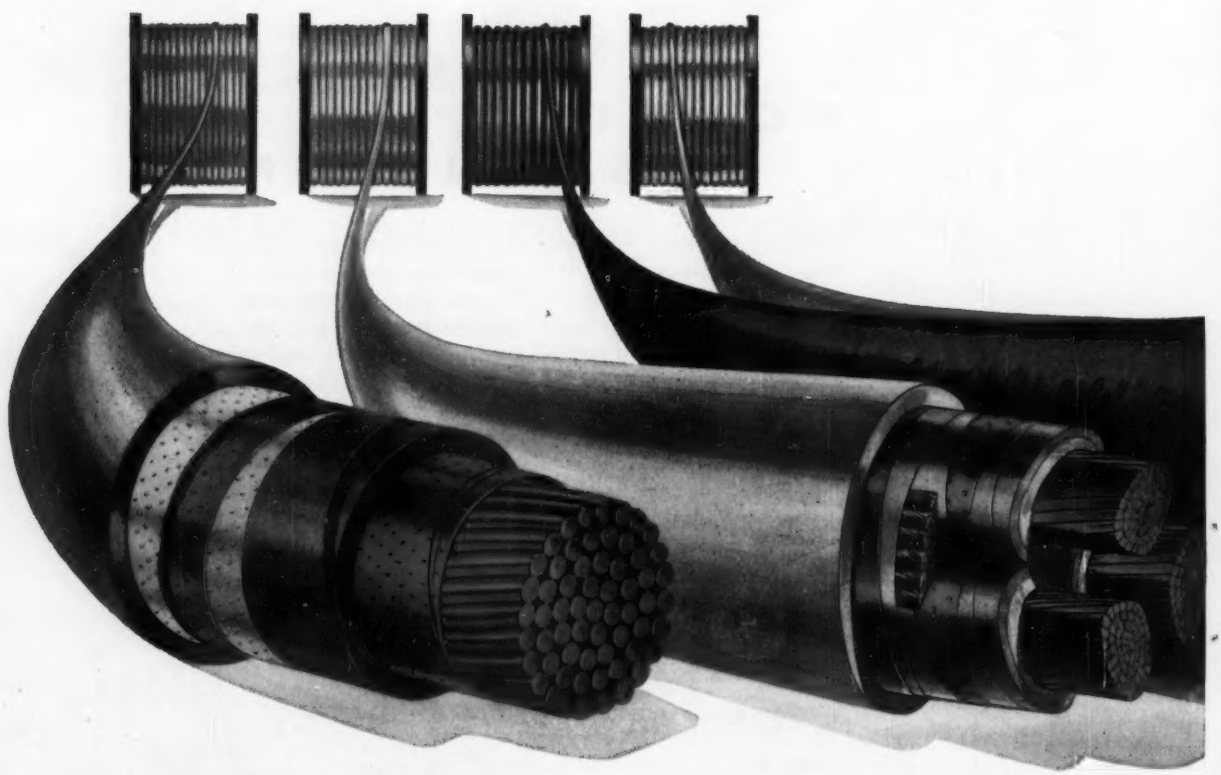
If your service depends on protection against fog, smog and industrial contamination, here is your answer—VICTOR'S new No. 961 Fogbowl Suspension. You can't buy better—at any price!

VICTOR INSULATORS DIVISION

I-T-E CIRCUIT BREAKER CO., INC. • VICTOR, N.Y.

FOR THE MOST EFFICIENT
POWER DISTRIBUTION . . . SPECIFY

PAPER-INSULATED CABLES BY PHELPS



Single conductor, 1 KV and up

Three-conductor, 1 KV and up

DODGE!

Phelps Dodge paper-insulated power cables have a *demonstrated record* of long life in a great variety of designs for all types of applications—underground duct, direct burial, submarine and aerial.

Paper-insulated cables have these important inherent characteristics that improve operating performance and lengthen service life:

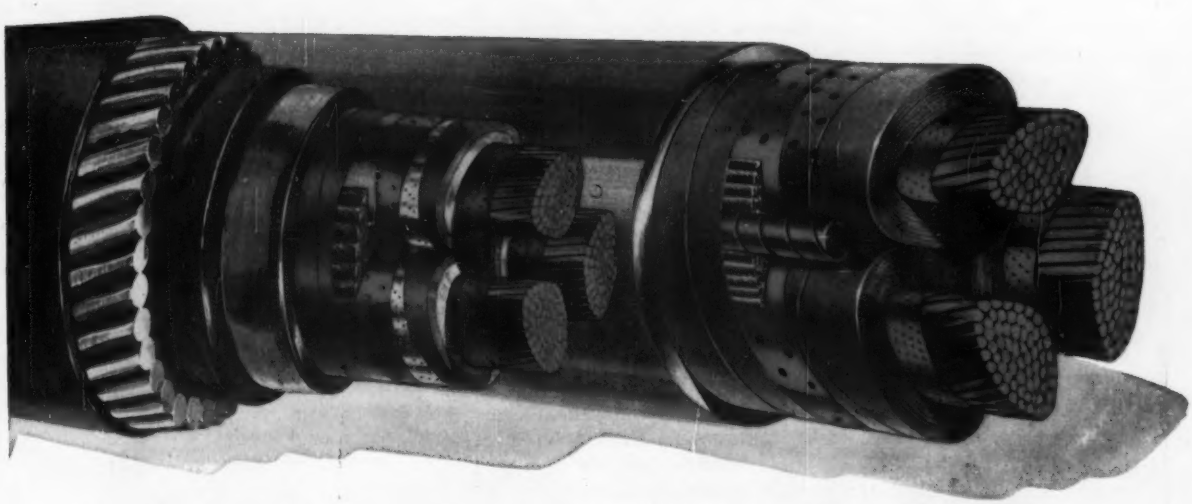
- Extra high 60-cycle and impulse strength to withstand switching and lightning surges.
- Ability to handle large blocks of power in single cables of minimum dimensions.
- Positive protection against all contaminations, due to being hermetically sealed in an extruded metallic sheath.

Paper-insulated cables can be supplied with either lead or aluminum sheaths.

Phelps Dodge offers the widest range of high voltage cables to the electrical industry.

PHELPS DODGE COPPER PRODUCTS CORPORATION

300 PARK AVENUE, NEW YORK 22, NEW YORK



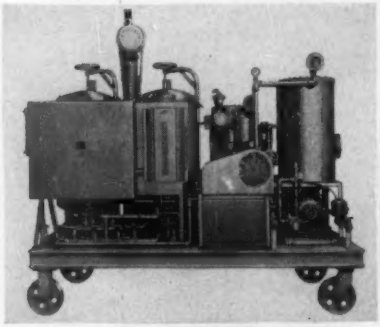
Submarine, 1 KV and up

Low-Pressure gas-filled, 8 KV and up

Restores
Insulating Oil for 11¢ per gal.!

Item	Cost Per Gallon
Cranite Filter Medium	$.0281
Bags & Accessories	.0050
Labor	.0118
Oil Lost In Processing	.0330
Depreciation	.0055
& Maintenance	.0040
Power	.0212
Inhibitor	
Total	$.1086

The above figures are based on an analysis of 3000 gallons of oil, with a neutralization number reduction from 0.60 to 0.08. Here's proof that the CFC Purivac filters, dehydrates and degasifies insulating oil for less than 11¢ per gallon. See how economically the CFC Purivac can be applied to *your* operation. Write today for complete information. Dept.-EW.



COMMERCIAL FILTERS CORPORATION
Melrose 76, Massachusetts
Plants in Melrose, Mass. and Lebanon, Ind.

Co-ops Double Electric Heat Homes

The number of electrically heated homes in rural Iowa has doubled in the past year, according to a recent article in Iowa Rural Electric News.

In early December, 1957, the Iowa co-ops estimated they had some 360 electrically heated homes, with an additional 30 to be added by the end of the year. At the same time in 1956 they had only 188.

The article says that the trend toward electric heat began about two years ago. Two of the state's 50 co-ops have 31 homes each, accounting for almost a fifth of all installations. They are Eastern Iowa Light & Power Cooperative and Southeastern Iowa Cooperative Electric Assn.

The selling points for electric heat are comfort, cleanliness and convenience. However, according to the News, cost of operation is important. Looking at costs of 129 homes on record, the average energy cost was $219.98 for a 10-month season. Average size of the homes was 1,293 sq ft.

Rates, also, came in for editorial treatment. Most of Iowa's co-ops have special heating rates ranging from 1.3¢ to 1.75¢. This jibes with results published in Electrical World's Electric Space Heating Report for 1957, in which some 45% of the utilities who promote electric heat have rates of 1.5¢ or less (EW, Dec. 16, 1957, p 102).

Methods of heating homes among the co-op's members break down this way:

- Ceiling cable—62%
- Glass panels—26%
- Baseboard units—6%
- Combinations of the above—6%

What has been primarily responsible for "switch to wire instead of fire" among the Iowa cooperatives? According to the News—

Biggest single factor has been low rates, but "add to that the fact that electric heating sells itself. Folks who have it like it, and the word gets around."

HEATING & COOLING

More Heat Pumps for AF

General Electric Co reports it has received two major orders within the last few months for 1,500 of its Weathertron heat pumps for installation from the Air Force. The heat pumps are for AF bases at Columbus, Miss., and Cocoa, Fla.

Electrically Heated School

New York State's first all-electrically heated school is well on its way to completion.

The $805,000 William T. Hoag elementary school, located in Buffalo, and possibly the largest electrically heated building in the State, is scheduled to be finished in Spring. According to school officials, the 600-pupil structure may herald a new era in school construction if the planned study of building and operating costs shows favorable results.

A close comparison between electric heating and a competing type will be available because another, almost identical, school is being built nearby which does not have electric heating.

Carrier's Master Plan

Carrier Corp claims to have developed a "master plan" for systematic installation of packaged air conditioning in multi-storied buildings. It is called "Multi-Weathermaker System."

(*More Selling on page* 78)

Connect COPPER with COPPER ALUMINUM with ALUMINUM

use...

PAC-5
ACSR 6—1/0 Cu. 8—1/0

PAC-3
ACSR 8—2 Cu. 8—2

PAC-4
(formerly PAC 6—0)
ACSR 6—1 0 Cu. 6—2

PAC-7 (replaces PARC 6—0)
ACSR 1 0—336.4
6—1 0 A R Cu. 8—1 0

BLACKBURN COPPER TO ALUMINUM FITTINGS

BLACKBURN PAC CLAMPS

ELIMINATE CORROSIVE SOLDERS, VOIDS AND FLUXES !

There are many satisfactory copper connectors for connecting copper conductors.

There are many satisfactory aluminum connectors for connecting aluminum conductors.

Blackburn's PAC clamps combine the features of a good copper connector and a good aluminum connector to give you the best copper to aluminum connector available.

Our exclusive method (Patent applied for) of pressure casting molten corrosion resistant aluminum alloy around specially treated pronged copper liners establishes an intimate, low resistance contact of the two metals without using corrosive solder.

The copper liners, which cannot be mated incorrectly, surround the copper conductor establishing a good copper to copper contact.

The aluminum grooves surround the aluminum conductors, establishing a good aluminum contact.

Adequate contact surface and conductor separation is built into Blackburn's PAC clamps to insure long-lasting, trouble-free copper to aluminum connections without setting up cold flow or galvanic corrosion.

Spring action is inherent in the design of PAC clamps and is supplemented with an extra-heavy spring lockwasher insuring permanently tight connections which will withstand temperature fluctuations.

Hot dipped galvanized steel hardware is standard. Aluminum hardware available on all but Catalog #PAC-3.

AVAILABLE THROUGH ELECTRICAL WHOLESALERS EVERYWHERE

JASPER BLACKBURN CORPORATION

1525 WOODSON RD. • ST. LOUIS 14, MO. • PHONE: WYdown 3-9430

"The Big Toaster" at a Glance

Use: Stress relieve pressure vessels of water-tube and fire-tube boilers to eliminate strains and stresses in welding seams. Vessel lengths range from 6 to 30 ft; diameters from 2 to 8.5 ft

Furnace Dimensions: 34 ft long x 13.5 ft wide x 13.5 ft high

Total Power Consumption: 388 kw. Fifty-four 3.5-kw, 8-ft metal sheath heaters on each side wall; star connected in six banks

Capacity for 8-hr Run: 26,000 lb

Temperatures: Normal operating, 1,150F; maximum, 1,600F

Car Length: 40 ft

Car-Bottom Furnace Cuts Stress-Relief Costs

A prize-winning 388-kw car-bottom furnace, designed and built by plant personnel, cut stress-relieving costs and speeded up production at Superior Combustion Industries, Wilkes Barre, Pa. Used to stress relieve pressure vessels for power boilers, the furnace enables Superior to handle the work in its own shop instead of having it done by an outside firm.

The results: trucking costs are eliminated; three to five days are knocked off the production time for each unit; cost per pound is less than one-half the cost of sending the vessels out.

Maintenance Cost Low

In operation for more than two years, the furnace has exceeded all expectations. Cost of operation is surprisingly low, with no replacement of elements, insulation, or controls. Maintenance consists chiefly of keeping thermocouple leads in repair and periodically tightening terminals inside the furnace. Loads up to 130% of design loading have been handled at a cost of less than half a cent per lb.

Built with the aid of knowledge picked up at Pennsylvvania Power & Light Co's metal sheath heater course, the installation was a $200 first-prize winner in Industrial Electrification Council's recent contest, "How I Switched On Electric Heat."

Although stress relief takes place at 1,150F, the furnace was designed for a maximum sheath temperature of 1,600F to minimize the possibility of overheating. Quick heat-up and uniform temperature throughout the furnace allow loads of varying sizes and shapes to be handled. With a load of 26,000 lb, the design maximum for an 8-hr run, temperature climbs to 600F in about 90 min. Above 600F, the rise flattens out to about 125F per hour.

With more than 50 8-ft heating elements, rated 3.5 kw apiece, on opposite walls, the 34 x 13.5-ft furnace was quickly nick-named "the big toaster." Heaters are designed for 277-v so they can be used as a 440-v star-connected load. Elements are arranged in six banks of 18 each.

The control system was designed for completely automatic operation. Each bank of heaters has its own contactor, fuse protection, and control circuit to permit operation at ⅓, ⅔, or full capacity. When the furnace reaches its preset temperature, a time switch takes control and shuts it down after the correct time has elapsed.

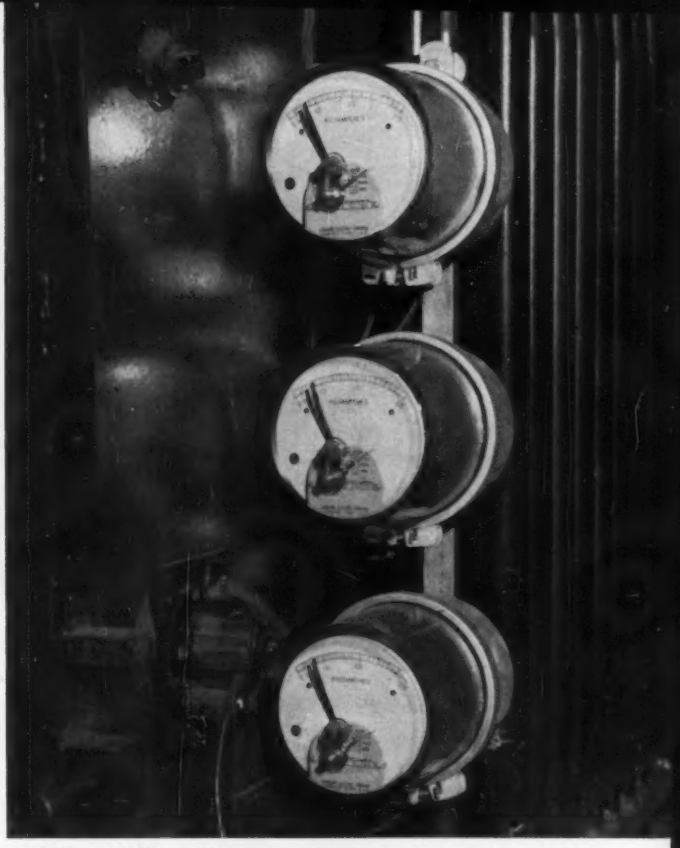
Operate Off-peak

Loaded and sealed in the late afternoon, the furnace is placed on the line when off-peak rates are in effect. For the benefit of the operator, a chart of off-peak hours in different seasons of the year is posted nearby.

The oven enclosure consists of 6-in.-thick light-weight insulating panels bolted to a steel frame. Cracks between panels are filled with the same insulating material. Because of the excellent sealing characteristics built into the furnace, forced circulation was not necessary.

Before the furnace was built, a comprehensive analysis was made of the different types of furnaces and fuels available. On the basis of experience, it is felt that the cleanliness, ease of handling, simplicity of control, and extra safety factor compared with other fuels leave nothing to be desired.

Want low-cost accurate measurement of network system loads?



Lincoln Type AD-6 thermally lagged ampere demand meters indicate loading of transformer and show maximum demand reached.

NEW Sangamo Combination provides permanent installation for continuous demand measurement at a cost of $31.35 per phase*

Now you can obtain continuous measurement of loading of network transformers with the simple, inexpensive installation of Lincoln Type CC split-core Transformers and AD-6 ampere demand Meters. The CC Transformer consists of two identical "C" shaped wound cores, which bolt together around the bushing of your network protector—without service interruption. They connect to adjacent meter sockets. When AD-6 Meters are plugged into these sockets they continuously measure the loading of the transformer and leave an indication of the maximum demand reached. When a more detailed study of loading conditions is required the AD-6 meter can be temporarily replaced with a portable graphic ampere demand meter (Lincoln Type CCA-6) which charts a continuous record of demand. Ask your Sangamo representative, or write for information.

These Lincoln Type CC split-core Transformers, bolted together around the bushings or cables of a network protector, are connected to adjacent meter sockets. Available in ratings of 1500, 2000, 2500 and 3000 amperes.

*Cost of CC Transformer and AD-6 Meter.

SM57-6

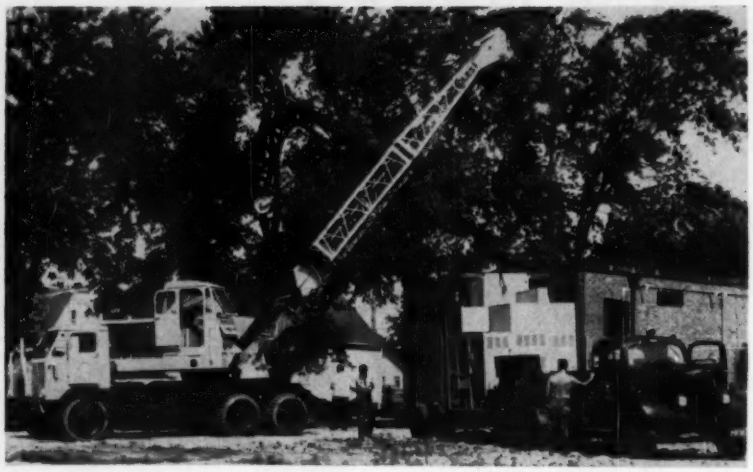
SANGAMO ELECTRIC COMPANY

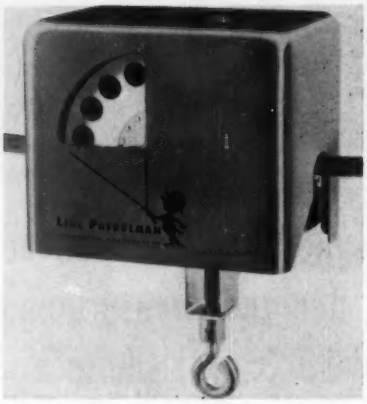
SPRINGFIELD, ILLINOIS

New Equipment

Crane . . .

. . . with 45,000-lb capacity has precision control. Combination of gas engine-generator-electric motor provides infinite range of speeds and inching ability. It is mounted on 4 or 6-wheel drive carrier.
Cole Cranes, Inc, Box 942, Joliet, Ill.





Fault Indicator . . .

. . . speeds fault location on 22 to 110-kv lines. Mounted with hot stick directly on cable, it fits conductors from No. 8 to 1.125 in. The target is visible at 125 ft, day or night. Known as the Line Patrolman, the unit registers up to four surges before locking out; it automatically resets when current is normal. Minimum fault current is 200 amp; minimum normal current, 20 amp.
Pneumafil Corp, 2516 Wilkinson Rd, Charlotte 8, N. C.

Rubber Insulator Hoods . . .

. . . fit all pin-type insulators up to Class 5. Reinforcing lugs on ends and on each side of center simplify placement or removal with hot-line tools. Inside surface of extending arms is ribbed to grip serrations on the Ubangi Line Hose.

Side walls on center portion are cut to permit use on small insulators without touching crossarm. When covering 7-in. diam. insulators on double-line construction, hood ends meet flush on 10.5-in. pin centers. If center distance is greater, short lengths of line hose may be used to cover exposed conductor. Field tests indicate unit is safe for energized circuits up to 15 kv and will resist puncture and harmful defects for 3 min at 26 kv.
W. H. Salisbury & Co, Morgan & Kinzie St, Chicago 22, Ill.

Dry-Type Transformers . . .

. . . with aluminum conductors and buswork are available in ratings from 300 to 2,000 kva. Aluminum conductors make use of welded internal joints more practical, provide "continuous conductor" construction. Elimination of bolts or other high-resistance joints minimizes chance of deterioration between conductor and bus as a result of heat cycling or conductor oxidation. All units in present line are sealed 3-phase type.

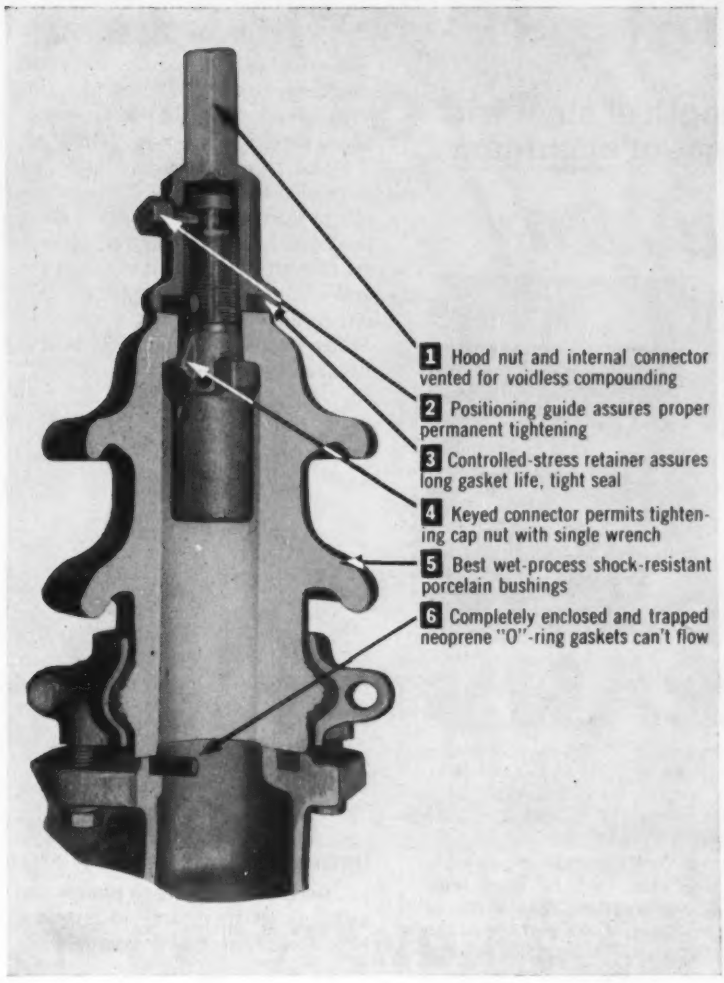
Units are lighter than previous models. Typical 750-kva 5-kv transformer is reduced about 1,700 lb, weighs about 11,500 lb.
General Electric Co, Schenectady 5, N. Y.

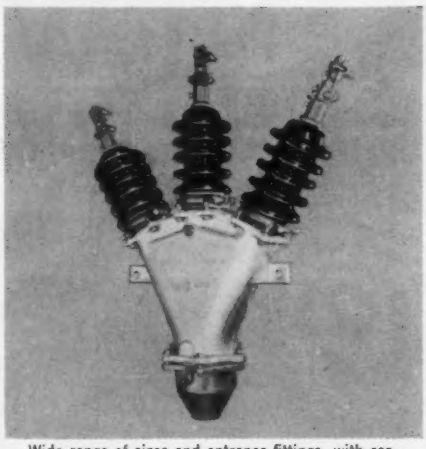
1-Phase Power Regulator . . .

. . . is redesigned model with transformer and tap-changing mechanism suspended from cover. Transformer and mechanism can be removed as a unit without disconnecting leads or removing terminals.

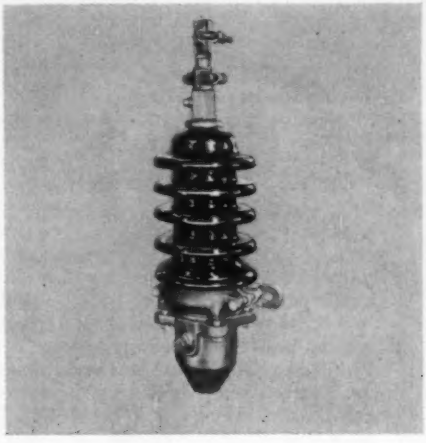
Hinged cover on side facilitates inspection of tap-changing mechanism. Vari-Amp feature provides 25 regulating combinations, permits increase in current capacity by reducing range of regulation. Ratings of 2,500, 5,000, and 7,620 kva are offered in all standard sizes. Regulation is ± 10%. Bulletin 21B6065D.
Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

(*More New Equipment on page* 82)


1 Hood nut and internal connector vented for voidless compounding
2 Positioning guide assures proper permanent tightening
3 Controlled-stress retainer assures long gasket life, tight seal
4 Keyed connector permits tightening cap nut with single wrench
5 Best wet-process shock-resistant porcelain bushings
6 Completely enclosed and trapped neoprene "O"-ring gaskets can't flow



Wide range of sizes and entrance fittings, with corrugated or petticoat-type bushings, meets most outdoor and indoor cable-sealing applications. Available with either three conductors (above) or single conductor (below).



Delta-Star Permanently-Sealed Terminators keep air and moisture out for good

2500 to 15,000 volts. Delta-Star SEAL-KAP Terminators reduce servicing problems. The special neoprene "O"-ring sealing design of this line of cable terminators results in a *permanently* air-tight and moisture-proof installation. Original cost, in addition to installation and maintenance costs, is low.

SEAL-KAP terminators are made in single- and three-conductor styles for both outdoor and indoor service. Lightweight cast-aluminum bodies help make SEAL-KAP terminators easy to handle, contribute to their economy of installation.

GET COMPLETE INFORMATION in this new SEAL-KAP Terminator catalog. Write DELTA-STAR ELECTRIC DIVISION, H. K. PORTER COMPANY, INC., 2437 Fulton St., Chicago 12, Illinois. District offices in principal cities.

H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

Porter Divisions: Connors Steel, Delta-Star Electric, Disston, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan Crucible Steel, W-S Fittings, H. K. Porter Company (Canada) Ltd.

It's NEW!

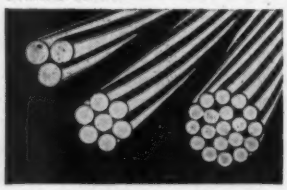
Wire that combines the strength of steel with the high corrosion resistance of aluminum

It's ACCO *Aluminized!*

PAGE STRAND

PAGE has successfully combined two time-tested metals into a revolutionary new wire—ACCO ALUMINIZED—that has a ductile, protective coating of aluminum *bonded* to iron and steel wire by a hot-dip method. This product is covered by and is manufactured under processes covered by U.S. and foreign patents.

Now PAGE offers ACCO ALUMINIZED Steel Strand for guy wire, ground wire and messenger wire applications. Can be used with Preformed Guy-Grip dead-ends made of ACCO ALUMINIZED Wire, or with galvanized pole hardware. Here is evidence of ACCO ALUMINIZED Steel Strand's superiority: salt spray tests conducted in strict accordance with ASTM procedures show that, for equal thickness of coating, aluminized *outlasts galvanized by more than 2 to 1.*



ALL STANDARD GRADES

PAGE ACCO ALUMINIZED Steel Strand is available in Common, Siemans-Martin, High Strength, Extra High Strength and Utility grades with physical properties meeting ASTM Spec. A-122-54-T and A-363-55-T.

NOTE: We will continue to make and market PAGE Stainless Steel Strand and PAGE Galvanized Strand, as heretofore, in 3-, 7- and 19-wire construction.

Also...PAGE *Aluminized* ACSR CORE WIRE

Aluminum Conductor Cable with PAGE ACCO ALUMINIZED ACSR Core Wire is now available from many manufacturers of conductor cable. Product quality control is assured by a special testing procedure mutually developed by PAGE and ALCOA.

Send for Informative Booklet

How about ductility and adherence properties of aluminized wire? Why does aluminizing create a true duplex coating over the core? How does aluminum "sacrifice itself" to provide electrochemical protection? For answers, write us at Monessen, Pa., asking for Booklet DH537-A.

ACCO for Better Values

Page Steel and Wire Division

AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

ACCO

Pruning Saw . . .

. . . has high reciprocating speed, smooth action. Redesigned valve mechanism increases speed to 1,200 strokes per min. Tooth angle reduces vibration and hand fatigue.

Standard models can be extended as needed to reach places inaccessible to hand or chain saws. Both insulated and non-insulated models are offered. Completed lopper, saw, and air compressor set-up are furnished adapted to users' needs.

Miller-Robinson Co, 7007 Avalon Blvd, Los Angeles 3, Calif.

Immersible Motors . . .

. . . for close coupling to pumps and agitators attach directly to impeller, have fewer connecting components. Motor and pump can be raised and lowered as unit. Available in ratings from ¾ to 40 hp, single or polyphase, they can be used in water, abrasive oils, chemicals, or sewage. Bulletin 2300 has further data.

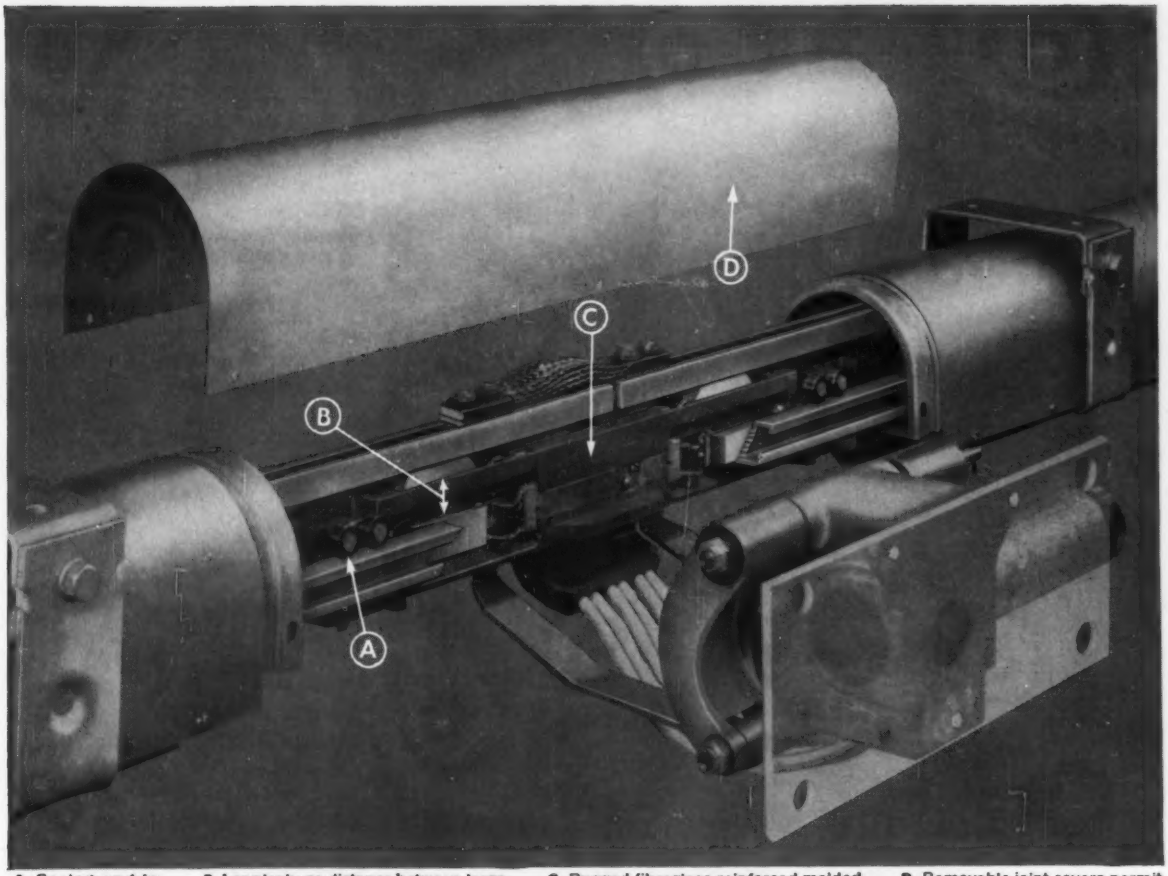
Louis Allis Co, Dept P, 427 E. Stewart St, Milwaukee 1, Wis.

Silicone Varnish . . .

. . . for coating and bonding Class-H insulation remains flexible and retains 90% of initial dielectric strength despite prolonged high temperatures. Low viscosity, 75 to 175 centipoises, assures good penetration and wettability. Material is 65% silicone solids.

R-610 has low water absorption and little loss of weight in curing or aging. Applied on glass cloth, it has dielectric strength of 1,800 vpm after initial curing, 1,560 vpm

(*Continued on page* 84)



A. Sealed and insulated wheels. **B.** Long leakage distance between large special-alloy sliding contacts. **C.** Rugged fibreglass-reinforced molded polyester trolley conductor body. **D.** Removable joint covers permit easy accessibility to trolley unit.

AN OUTSTANDING SAFETY ADVANCE

in supplying power to cranes

LEC-TROL-FEED®

Two men can handle 30-foot sections of LEC-TROL-FEED system with ease.

Here is undoubtedly the finest traveling-contact equipment on the market. LEC-TROL-FEED provides the utmost in safety and dependability for the powering of cranes and other equipment traveling on straight runways, such as hoists, conveyor-belt trippers, and automatic welding units. A unique safety slot in bottom cover offers maximum protection against accidental contact with live bus bars. And your installation and maintenance costs with a LEC-TROL-FEED system are drastically lower than with ordinary trolley systems.

Rugged precision design for easy installation and minimum maintenance. Specifically engineered to eliminate the problems encountered through dirt accumulation in ordinary trolley systems. Truly the best and safest busway system you can buy. Available with bronze, aluminum, or copper bus bars, in ratings of 180, 260, and 330 amperes respectively. Standard trolley illustrated above rated 100 to 130 amperes. Higher amperages available with multiple-trolley installations.

FREE BROCHURE. The full story on LEC-TROL-FEED is given in this illustrated folder. Get one from your nearest Delta-Star representative, who will supply engineering specifications based on your installation requirements and operating conditions. Or write DELTA-STAR ELECTRIC DIVISION, H. K. PORTER COMPANY, INC., 17th and Cambria Sts., Philadelphia 32, Pa. District offices in principal cities

H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

Connors Steel, Delta-Star Electric, Disston, Forge and Fittings, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan Crucible Steel, H. K. Porter Company (Canada) Ltd.

You Get More Economy, Meter Reliability!

In over 8 million meters with magnetic suspension put in service, not one magnetic suspension assembly has ever been replaced as a result of wear. Ask your G-E salesman, he'll show you the facts.

628-4

GENERAL ELECTRIC

INDIANA STEEL & WIRE CO. Crapo Galvanizing MUNCIE, IND.

Signs along the lines of Crapo GALVANIZED STEEL STRAND PERFORMANCE

For dependable performance . . . insist upon Crapo Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes Crapo Steel Strand first choice for guys, messenger and overhead ground wire.

The famous Crapo galvanizing process provides dependable protection for the steel, prolongs the expectant life of the strand.

- Low maintenance cost
- Laboratory tested and controlled quality
- Meets highest quality standards
- A size and grade for all practical needs
- Contact your Crapo Jobber Today!

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

your future is in your hands

Right now you're holding the one *basic* reference in the electric power industry. Used regularly, it can help you, as it helps more than 26,000 others in all capacities to do a better job, get ahead faster. Get the ELECTRICAL WORLD habit.

Whether a Winch Line Hook or a complete Line Body check your requirements with

UTILITY TOOL & BODY CO.

CLINTONVILLE, WISCONSIN

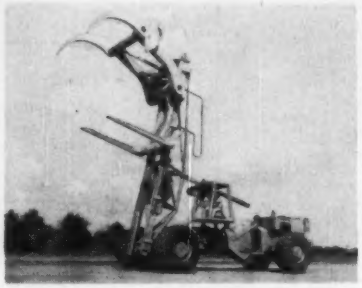
UT&BCo

Silicone Varnish

(*Continued from page* 82)

after 700 hr at 275C (ASTM test D1346-56T). Dielectric constant is 3.28 at 25C and 100 cps. Drying time is 10 min. at 250C, one hr at 200C.

Silicones Div, Union Carbide Corp, 30 E. 42nd St, New York 17, N. Y.



Fork Lift . . .

. . . for rough terrain can lift 22 tons with great precision. Called the Series FJ Stacker, it can be fitted with fork, crane, ram, fork and tusks, or fork and jointed tusks. The all-electric machine has no mechanical drive mechanisms. High torque motors spotted over the machine deliver geared power directly to point where it is needed.

R. G. LeTourneau, Inc, 2399 S. MacArthur, Longview, Texas.

Explosion-Proof Motors . . .

. . . have centrifugally cast rotors for better durability. Stator cores are welded under pressure, then cylindrically ground for absolute concentricity.

Fan-cooled type KZCX motor, in ratings from 1½ to 30 hp, has highly efficient cooling system which keeps air stream close to motor surface to eliminate hot spots and dust accumulation. Type KZEX, nonventilated motors in ratings up to 1½ hp, has high surface-area-to-volume ratio for improved cooling.

Heavy paper and varnished cambric slot cells are folded at ends to lock cell in slot and protect coil at end of slot. Grease reservoirs can be flushed and filled from motor surface. Optional features include

automatic drain plugs, and bronze fans and slingers for corrosive atmospheres.
Fairbanks, Morse & Co, 600 S. Michigan Ave, Chicago 5, Ill.

Plastic Laminates . . .

. . . include 9 types of flame retardent, high strength insulating materials. Chemical additive dampens and extinguishes flames started by electric arc. Materials include paper base with phenolic resin, glass mat with polyester resin, and glass base with epoxy resin. Some of the suggested uses are switchgear construction, phase barriers, tap-changer supports, terminal blocks, and armature slot wedges. A wide range of thickness, sheet sizes, and tube and rod diameters is offered.
Continental Diamond Fibre Corp., Newark, Del.

MORE NEW PRODUCTS

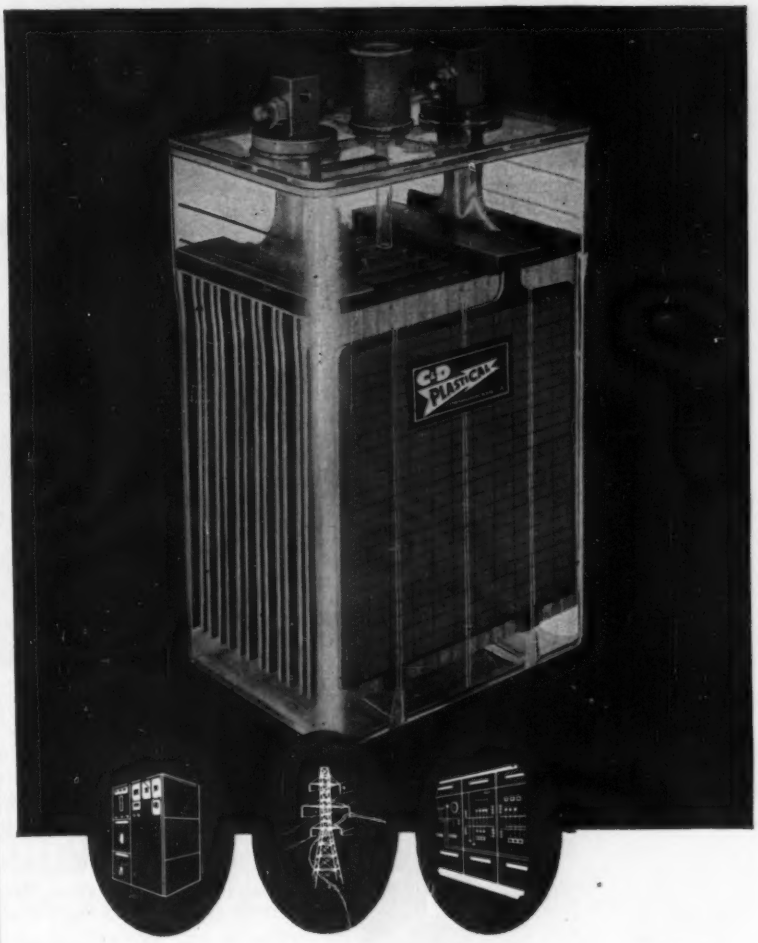
Four-pole **plug-in busway** can serve as vertical riser in multi-story buildings. It features low voltage drop characteristics. — General Electric Co, Distribution Assemblies Dept, Plainville, Conn.

Two mobile **magnetizers** combining coils and silicon rectifier into single unit can be plugged into 115-v ac outlet. General Electric Co, Metallurgical Products Dept, Detroit 32, Mich.

Multitester has 60 ranges, sensitivity of 15,000 ohms per v ac, 30,000 ohms per v dc. It weighs 3½ lb.—Dyna-Vac Co, Box 12146, Atlanta 5, Ga.

Explosion-proof **temperature control** comes with any one of three standard single-pole switches suitable for 180F ambient and rated 15 amp at 115-230 v ac.—United Electric Controls Co, 79 School St, Watertown 72, Mass.

Model 291 2-way **solenoid valve** is a small, general purpose unit for air, gas, water, oil, and common industrial fluids—A P Controls, 2450 N. 32nd St, Milwaukee 45, Wis.



The battery 'engineered for control' ... 25-year life ... low maintenance

C & D PlastiCal®

What will be happening when the 1980's roll around? The only thing you can be reasonably sure of is that the C & D *PlastiCal®* Control Batteries you install today . . . *will not require replacement until then.*

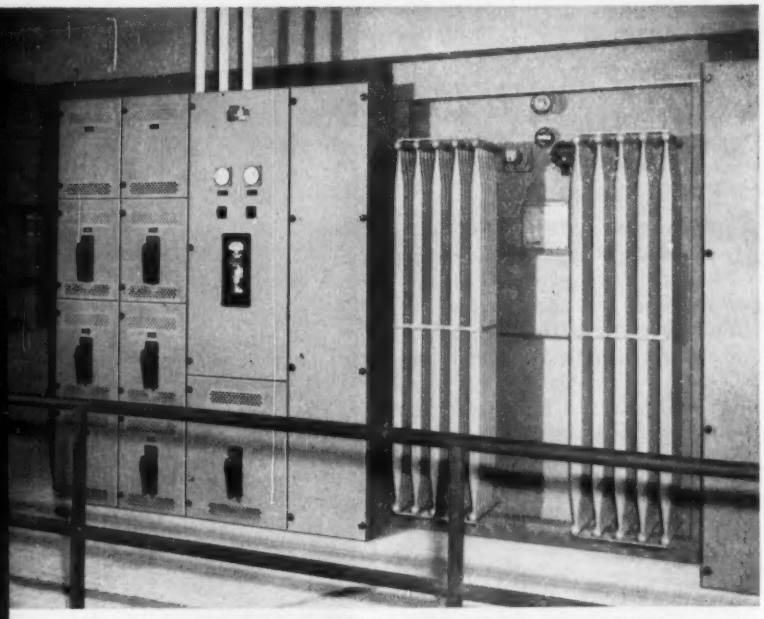
Twenty-five-year life? Yes! C & D "Control" Batteries are not only designed specifically for control, switchgear, and auxiliary power applications—they're engineered to last a quarter of a century. Users even boast that these advanced lead-calcium plate batteries only have to be watered about *once a year.*

For ample, dependable battery power *instantly* when you need it, it pays to specify C & D *PlastiCal.* It pays . . . in the long run, too.

For details, send for Bulletin CP-536

C&D BATTERIES, INC.
of Conshohocken, Pa. ... Attica, Ind.
SINCE 1906
SALES AND SERVICE OFFICES IN PRINCIPAL CITIES FROM COAST TO COAST

WAGNER Close-Coupled Transformer permits compact load-center for TRANE COMPANY



This Wagner 1000 kva Noflamol close-coupled Transformer is installed in Trane Company's new $1,250,000 Engineering Building.

One of the many unusual features of The Trane Company's new Engineering Building at LaCrosse, Wisconsin, is a display room for the air conditioning equipment that serves the building. A full glass wall in this room permits visitors to view the Trane CenTraVac water chiller and master control panel, the pump room and the unit substation that handles the power load distribution for the building.

A Type JP 1000 kva Wagner close-coupled transformer was chosen to power the unit substation. Wagner close-coupled transformers fit flush against the switchgear enclosures, eliminating throats and saving space. Connections are made at the bushings on the sides of the transformer. Bushing heights are designed to give ample room for connection to switchgear or busses and eliminate need for special throats to match special switchgear. These noninflammable liquid-filled transformers are available in ratings from 500 through 2000 kva.

Consult your nearby Wagner Sales Engineer about the complete Wagner line of Unit Substation Transformers—both liquid-filled and dry-type. Bulletins TU-205 and TU-214 give full information on Wagner Unit Substation Transformers for industrial power needs. Write for your file copy today.

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

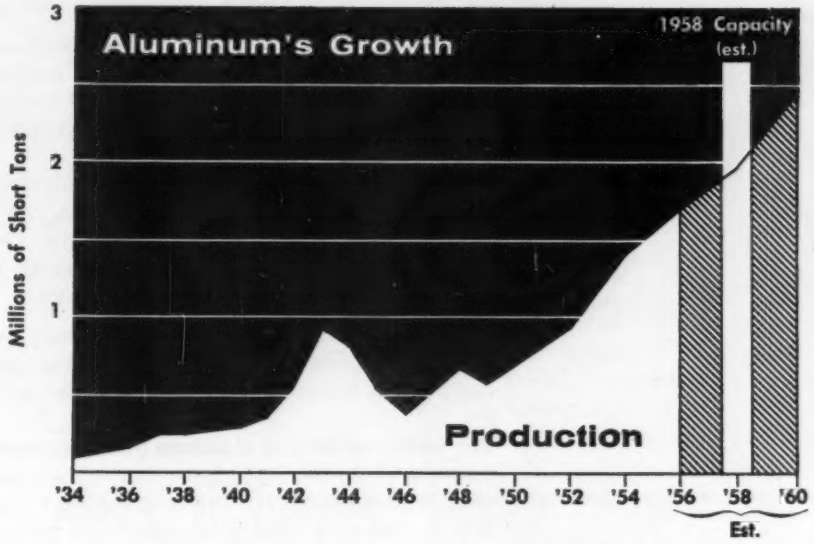
WT58-2

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

The Electrical Business Outlook



Source: Aluminum Review, E & MJ, Feb. 1957

Aluminum Looks to the Future

"You never get anywhere by standing still" could be the maxim of the rapidly-expanding U. S. aluminum industry. With its present expansion plans and its capacity geared to future uses, the industry is now passing through an unpleasant period of producing tomorrow's supply in the face of today's demand.

But tomorrow's demand is expected to skyrocket, and aluminum men foresee a future that gleams as brightly as the metal they produce.

The phenomenal growth of aluminum is scarcely paralleled in the history of modern industry. Since 1939, national per-capita consumption has jumped from three to 24 lb annually. A material seen chiefly in pots and pans less than two decades ago now is used for airplanes, railroad cars, buildings, food containers, and a long list of other products.

Production has boomed. U. S. primary production—the output of reduction plants which turn alumina (aluminum oxide) into 99%-pure aluminum ingot—has tripled in the last 10 years. Although 1957 production may lag expectations, it could possibly top 1½ million tons.

Aluminum's growth shows no signs of a slowdown. The industry is now in the midst of an extensive expansion program, and in spite of some cutbacks and stretchouts U. S. primary aluminum capacity is expected to reach 2½ million tons per year by the end of 1958.

The big question for 1958 is: Will aggressive boosting of new uses be sufficient to make up for a slower pace of business? The progress made by aluminum producers toward finding new outlets for their product in 1957 lends credence

(*more*)

to the belief that nothing short of a major economic collapse will send them under.

The 1958-model **automobiles** used 29% more aluminum than the '56's, on the average. According to the Aluminum Co of America, the average 1958 car contained 52.4 lb of aluminum, and a Cadillac Brougham used 305 lb.

More uses for aluminum have been found in the **building** industry, which accounted for 1/5 of aluminum consumption during the first six months of 1957. They range from window screens to skyscraper skins.

Aluminum containers are another important frontier of the metal's expansion. Standard Oil Co of New Jersey has started using recoverable aluminum oil cans. Kraft cheese in aluminum containers will be distributed early this year. An American brewery is experimenting with aluminum beer cans.

Few industries are so closely intertwined with electricity. It takes about 10 kwhr to refine a pound of aluminum, and cost and availability of power usually determines the location of reduction plants. On the other side of the coin, aluminum is one of two materials economically suitable for large-scale use as an electric conductor—copper being the other.

Many of aluminum's gains in copper territory were made while copper prices were high and while copper was scarce. The present low price of copper will make further inroads by aluminum somewhat more difficult.

The relative stability of aluminum prices has been a point in its favor. Current price (28.1¢ per lb—ingot) is the highest in the metal's recent history, but stands only 8¢ above the 1939 price. Prices were stabilized at 15¢ during World War II, and since 1946 prices have risen gradually.

Part of this price stability is due to the dominance of a few producers. The "Big Three" (Alcoa, Reynolds Metals Co, Kaiser Aluminum & Chemical Corp) have each been able to keep prices down, and so far have been able to keep them up during times of plenty.

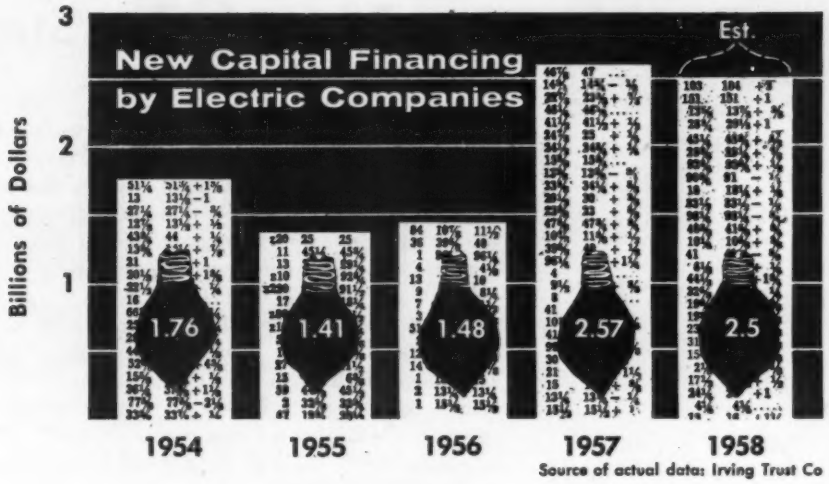
The government has also helped. To encourage expansion of aluminum capacity during the Korean War, the government agreed to buy part of any surplus aluminum produced as a result of that expansion. However, these agreements expire in 1958 and 1959.

Prices will probably remain stable in 1958. Aluminum seems destined to be in plentiful supply throughout the year, and this can be expected to hold prices down. At the same time, the aggressive development of new uses for the metal will probably provide enough consumption to make price cuts unnecessary.

Where Wrought Aluminum Products Went

	First half '55 %	First half '56 %	First half '57 %
Building Materials	19.2	19.0	20.6
Transportation	16.6	17.4	18.3
Distributors & Jobbers	14.5	16.7	15.2
Electrical	7.6	7.8	8.9
Consumer Durables	13.3	13.0	10.5
Containers & Packaging	4.9	4.4	6.5

Source: The Aluminum Association



Source of actual data: Irving Trust Co

'58 Will Favor Heavy Financing

New security offerings by electric utility companies jumped to $2.57 billion in 1957. And 1958 is expected to be another big year for new capital financing. With construction budgets hovering around the $4 billion mark, somewhere around $2.5 billion in new capital offerings is estimated for this year. About $1.5 billion will probably be in bonds.

Approximately $1.4 billion in expected financing has already been reported to the Irving Trust Co for 1958—about $1 billion of it in debt issues.

Luckily for the industry, yields on '58 issues should be lower than in '57. A new low in yields for an offering of Moody's Aaa rated electric utility bonds was set recently when an issue of Connecticut Power & Light Co was offered on a 3.89% basis—nearly 1% below top yields on similar issues during the peak period last fall.

Many experts are predicting that yields are headed lower. One usually accurate source predicts a decline in interest rates on outstanding Moody's Aaa-rated bonds of more than ¼% per annum, comparing their estimated average yields for this year with yields on Dec. 31, 1957. Comparing 1957 year-end yields with their estimated '58 low, this decline exceeds ½% per annum.

Yields on new security offerings customarily reflect greater swings both up and down than those on outstanding issues, so that if this estimate proves correct, somewhat greater declines in yields on new issues could be expected.

Hayden Stone & Co cites influences tending to improve the bond market, including a lower Federal Reserve Board discount rate, a lower prime rate, a rise in the debt limit, and an easier credit policy by the Fed. Political pressure on the administration will also exert an easing force on money.

Donald I. Rogers, financial editor New York Herald Tribune predicts further Fed action, in the form of a reduction in reserve requirements and another cut in the discount rate "in the near future."

C. E. EBLE

Con Ed Looks for 'Steady Growth'

Consolidated Edison Co of N. Y. expects its load to increase about 25% in the next five years (5% a year), according to Pres. C. E. Eble. Eble, in addressing the New York Society of Security Analysts recently, conceded that this growth is somewhat slower than the 10-yr industry average but indicated that it corresponds to Con Ed's experienced rate of growth. Revenue for all services also continues to show a modest but steady growth of about 5% per year.

A record total of $200 million is budgeted for construction in 1958 to meet this increased demand. Construction expenditures in 1957 were $146 million. The utility will have to sell some securities and increase its bank loans to help finance this 1958 construction program. About $100 to $125 million must be raised. During the five year period 1958-62, 1,275 Mw of generating capacity will be installed. Cost of this expansion plus other electrical system needs will be about $720 million.

An adequate return is becoming increasingly difficult to earn, according to Eble, because inflation is affecting both current operating expenses and cost of new plant. Con Ed has attempted to offset the rising cost of doing business by effecting economies through the utilization of more efficient equipment. But apparently this has not been sufficient to completely stem the inflationary tide. So today, Con Ed looks to the regulatory authorities for relief.

What is the attitude of the New York Public Service Commission? Favorable to both investor and customer, answers the Con Edison president. To support his contention, Eble cited recent Commission recognition of the need for more adequate returns so that utilities can maintain their competitive financial status in the present economic picture. He specifically referred to a decision involving a major New York utility (New York Telephone Co) wherein by unanimous action of the full commission rates for services were prescribed permitting a return of 6½%. Con Ed's current rate of return, based on book value, is about 5.15% on electrical property, 4.0% on gas, and 2.5% on steam.

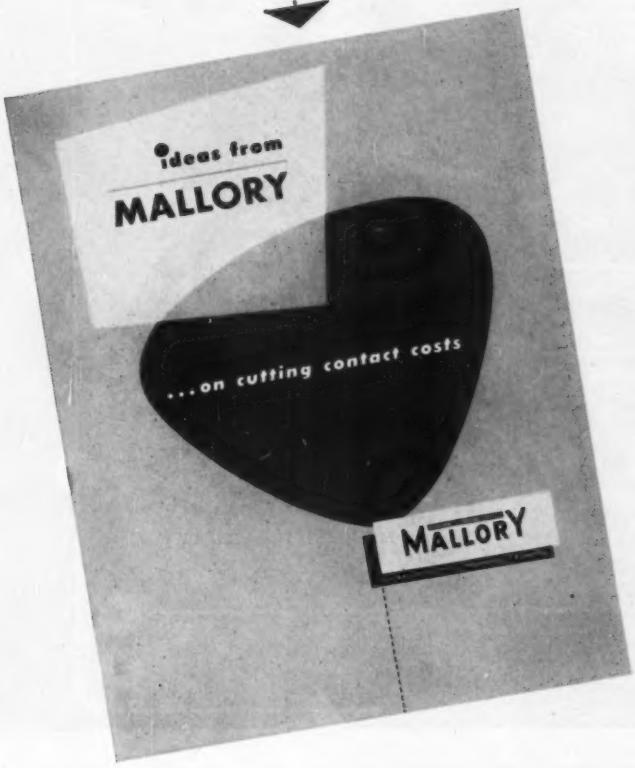
At present the utility has two matters pending before the commission that involve annual revenue increases of $11 million. It has recently been granted a gas rate increase amounting to $4.8 million annually. There is no broad electrical rate increase contemplated; but, said Eble, "only time will tell" if such a move will be considered. He stressed that it is very important to keep your business healthy by getting a fair price for your product. And he further stressed that this need for adequate rates is not unique to New York City (EW, Nov. 4, 1957, p 58).

Earnings for 1958 should improve over those of 1957. Eble would not quote a figure but he gave the hope for a favorable tax settlement with New York City, a reduction in gas operating expenses due to completion of the gas conversion program, and a possible operating saving with the use of electronic business data process machines as reasons for his optimism about earnings.

Conversion to common stock of an outstanding $56-million debenture issue may be possible with the anticipated improvement in earnings. This in turn should strengthen Con Ed's position to do debt financing if desirable to meet in part 1958 construction commitments.

Want to Cut Contact Costs?

See This Mallory Book!



MAYBE you have been overlooking some important savings that could be made in the electrical contacts you use in your products. Mallory has been helping design engineers uncover new sources of cost reduction through Contact Engineering Service. To give you some thought-starters on the subject, we've collected a number of actual case histories and put them in a convenient booklet.

In the reported savings on contacts for products ranging from magnetos to circuit breakers, we're sure you'll find ideas that are closely related to your own applications.

And we're sure, too, that we can do the same for you . . . by putting our long experience to work for you in engineering contacts, selecting the right Mallory alloy, and coordinating design of complete contact assemblies.

Write for a copy of this booklet . . . and call on us for a consultation on the cost-cutting possibilities of your particular contact problem.

Expect more . . . get more from

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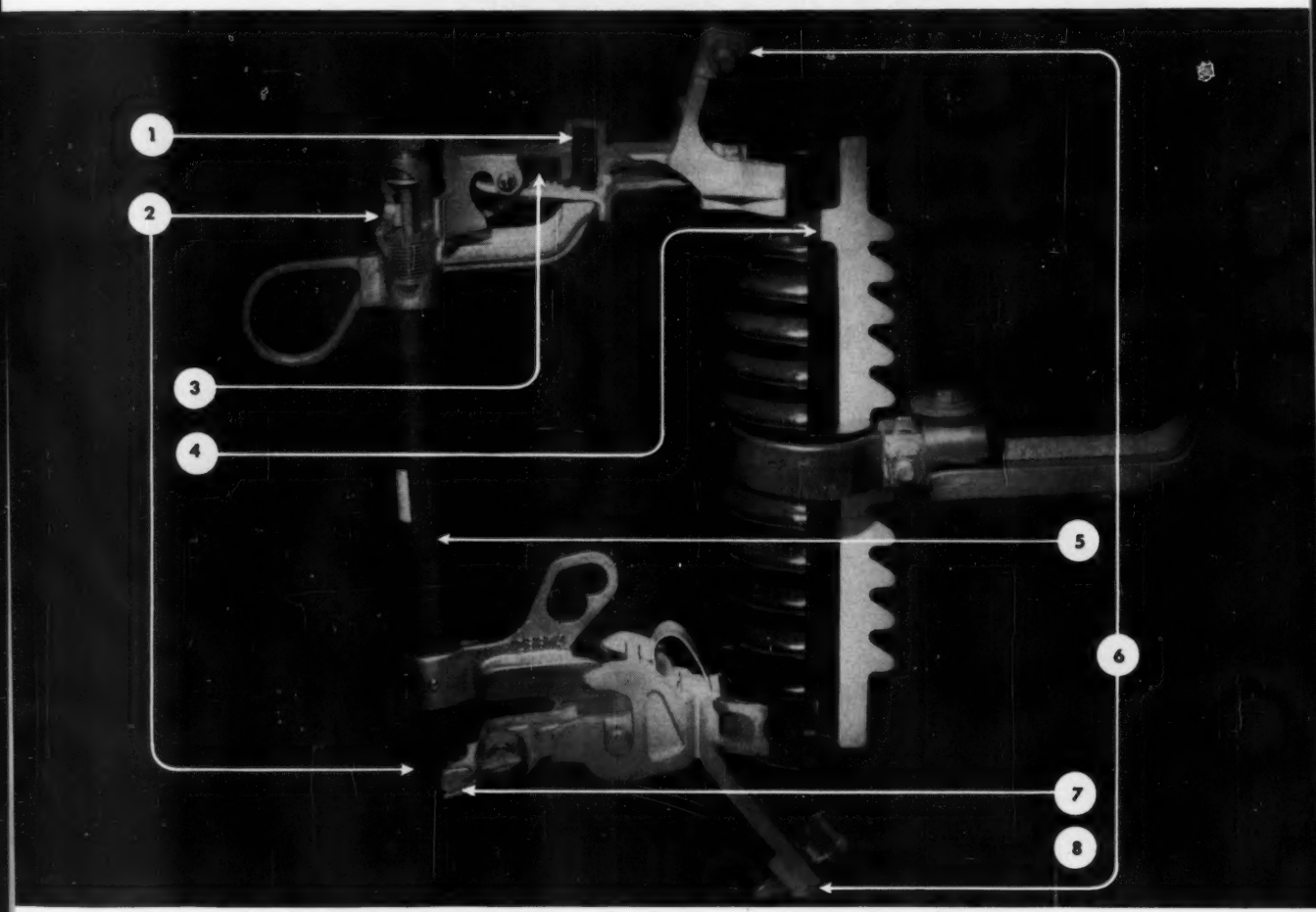
Serving Industry with These Products:

Electromechanical — Resistors • Switches • Tuning Devices • Vibrators
Electrochemical — Capacitors • Mercury and Zinc-Carbon Batteries
Metallurgical — Contacts • Special Metals • Welding Materials

For full range fault protection

Here, in this cutaway photograph, you can see some of the reasons why the Kearney Extra Heavy Duty Type G Cutout provides such full dependability on high, medium and low current interruption. Look over these design features and make a note to ask your Kearney representative about each one on his next call.



1. Full Floating Contact—stainless steel spring absorbs upward thrust, maintains contact pressure until arc is extinguished.
2. Gas Vents—double vent action minimizes internal gas pressure.
3. Horizontal Stainless Steel Spring—helps absorb recoil during fault interruption, takes shock when closing cartridge.
4. Insulator—designed for strength and lightness, barrier prevents internal leakage.
5. Cartridge—½" bore permits interruption of low faults; extra strength tube withstands pressure of high currents; accepts universal fuse links; no need for adaptors and other gadgets.
6. Terminals, Plated T-Lug Design—for use with all types of conductors.
7. Flipper—whip action provides 4" travel in separating blown fuse link.
8. All live parts either non-ferrous or stainless steel.

JAMES R. KEARNEY CORPORATION General Offices: 4224-42 Clayton Ave., St. Louis 10, Mo.

. . . specify KEARNEY Type "G" Cutouts

Look beyond maximum fault current calculations when you examine protection requirements on your system. Experience tells you that in most locations you can expect low and medium as well as severe fault currents . . . and you'll want a cutout that can stand up under all these conditions.

The test data summarized (below), together with the field-proved record in all parts of the United States, means just one thing. When you specify Kearney Type G Cutouts you have specified full range fault protection.

High, Low and Medium Fault Tests—KEARNEY EHDG-781 Cutout

SPECIMENS: Production Line Cutouts and Cartridges.

OBJECTIVES:

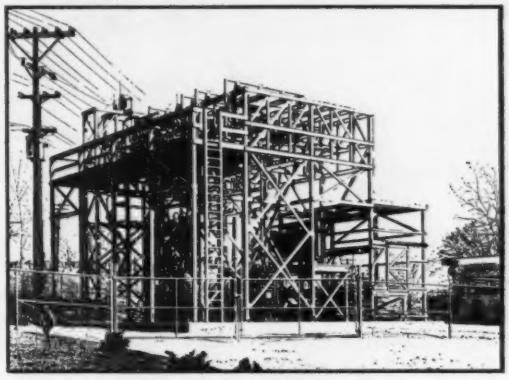
(1) To determine if Kearney EHDG Cutout will pass NEMA Extra Heavy Duty Interrupting Rating of 10,000 amperes at 7.8 KV, 20% power factor.

(2) To determine if Kearney EHDG Cutout will interrupt various low and medium currents from 15 to 800 amperes.

PROCEDURE:

(1) For the 10,000 amperes hi-range tests, the Kearney Test Substation was set up to deliver a maximum of 9,950 asymmetrical RMS amperes at 7.69 KV, 20% power factor. Four cutouts were tested using Kearney fuse links with 10 to 100 ampere rating.

(2) For the low and medium ranges, the Test Substation was set up to deliver 17 amperes at 99% power factor; 144 amperes, 432 amperes, 715 amperes at 20% power factor. Voltage in each case was 7.69 KV.



Kearney Substation Laboratory—

150,000 KVA transformer capacity, with back-up capacity of 445,000 KVA. For equipment testing under rigorous field conditions. Guarantees Kearney Certified Ratings to be proved performance ratings.

RESULTS: ***High Interrupting Capacity***

The Kearney EHDG Cutout interrupted its rated 10,000 amperes at 7.69 KV—20% power factor without difficulty. Each of four units cleared five shots *without a failure.*

Low and Medium Interrupting Capacity

Four units cleared the circuit without trouble. Each was shot five times at one of the following currents: 17, 144, 432 and 715, approximate.

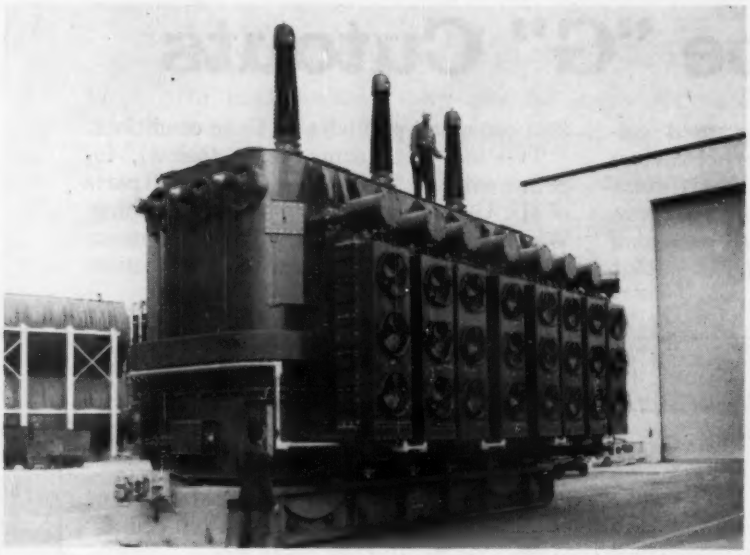
JRK-382

For Better Construction . . . Safer Maintenance

Specify KEARNEY Products

Plants at: ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IA. • GUELPH, ONT., CAN.

Manufacturers and Markets



Memphis Gets 315-Mva Transformers

Last of three 315-Mva, 161-kv power transformers for the City of Memphis, Tenn., was shipped recently from General Electric's Power Transformer Department in Pittsfield, Mass. Before shipment the transformers were assembled for sound tests as shown in the picture.

Reported the largest built in their voltage class, each transformer was 12 by 15 by 25 ft and weighted 207 tons when readied for shipment. Each one was shipped upright in one-piece tanks on drop-frame freight cars. When installed with bushings and coolers and filled with oil, each transformer will weigh about 281 tons.

Westinghouse Developments Reported

Recent developments at Westinghouse Electric Corp include the following:

• Thirty-five large motors under construction at Sunnyvale, Calif., will drive ore crushing and grinding equipment in the $200-million Toquepala project of Southern Peru Copper Corp. The project is in the Andes Mountains, near Tacna, Peru. Twenty-one identical 800-hp motors will drive rod mills and ball mills. Fourteen others, ranging from 300 to 500 hp, will drive crusher and grinding mills.

• Alpine Montan, Vienna, Austria's largest industrial and mining enterprise, has ordered over $8 million in electrical equipment from Westinghouse International to power three new steel rolling mills. The order is part of a $56-million modernization and expansion program. Westinghouse will supply 46 main drive motors delivering a total 37,350 hp. The project is partly financed by a $20-million Export-Import Bank credit.

• Westinghouse is building a manufacturing and repair plant at Charlotte, N. C. Located on a 6.5-acre site, the 24,000-sq-ft building is slated for completion in mid-1958. Robert Muir, Jr, is Charlotte M&R manager.

• A new office building at the carrier-microwave department in Halethorpe, Md., has permitted a 17% expansion of the adjacent manufacturing area. Production and engineering activities have been expanded.

Okonite Okocord Carries Power to "River Queen"

A 3-conductor portable Okocord cable supplies power to the "River Queen," a large power shovel used by the River Queen Coal Co in strip mining near Greenville, Ky.

The 3-in. dia cable, totaling 5,000 ft, connects the substation, cable skid, and the reel underneath the shovel. This product of Okonite Co, Passaic, N. J., carries 4,160-v power to operate 15 motors ranging from 187 hp dc to 1,500 hp ac. In the shovel operations the cable is frequently reeled and unreeled, dragged over rocky ground, and often left in mud and water.

The River Queen, the largest shovel made by Bucyrus-Erie, South Milwaukee, Wis., is reported capable of removing as much as 33,000 tons of overburden in 8 hr. The dipper can scoop 80 tons of dirt and rock. The shovel is as high as a 13-story building and weighs 2,400 tons.

Lewiston Power Plant Bids Opened by PA of N. Y.

The Power Authority of the State of New York recently opened bids for construction of Lewiston Power Plant of the Niagara Power Project at Lewiston, Niagara County, N. Y. There were four bids.

Apparent low bidder was the firm of Merrit-Chapman & Scott Corp, 260 Madison Ave, New York, which submitted a bid of $98,288,498.

The other bids were submitted by joint ventures. They are:

Perini, Walsh & Langenfelder, Framingham, Mass. — $101,778,-312.

Guy Atkinson, Ostrander, American Pipe, Arundel Corp, L. E. Dixon Co, and six others, San Francisco, Calif.—$104,260,752.50.

Niagara Constructors, consisting of Peter Kiewit, Morrison-Knudsen Co Inc, H. J. Kaiser Co, S. J. Groves & Sons Co, and Cunningham-Kiewit, Omaha, Neb.—$117,215,818.

Bids will be evaluated by the Authority's consulting engineers before a final award is made.

(*More M&M on page 96*)

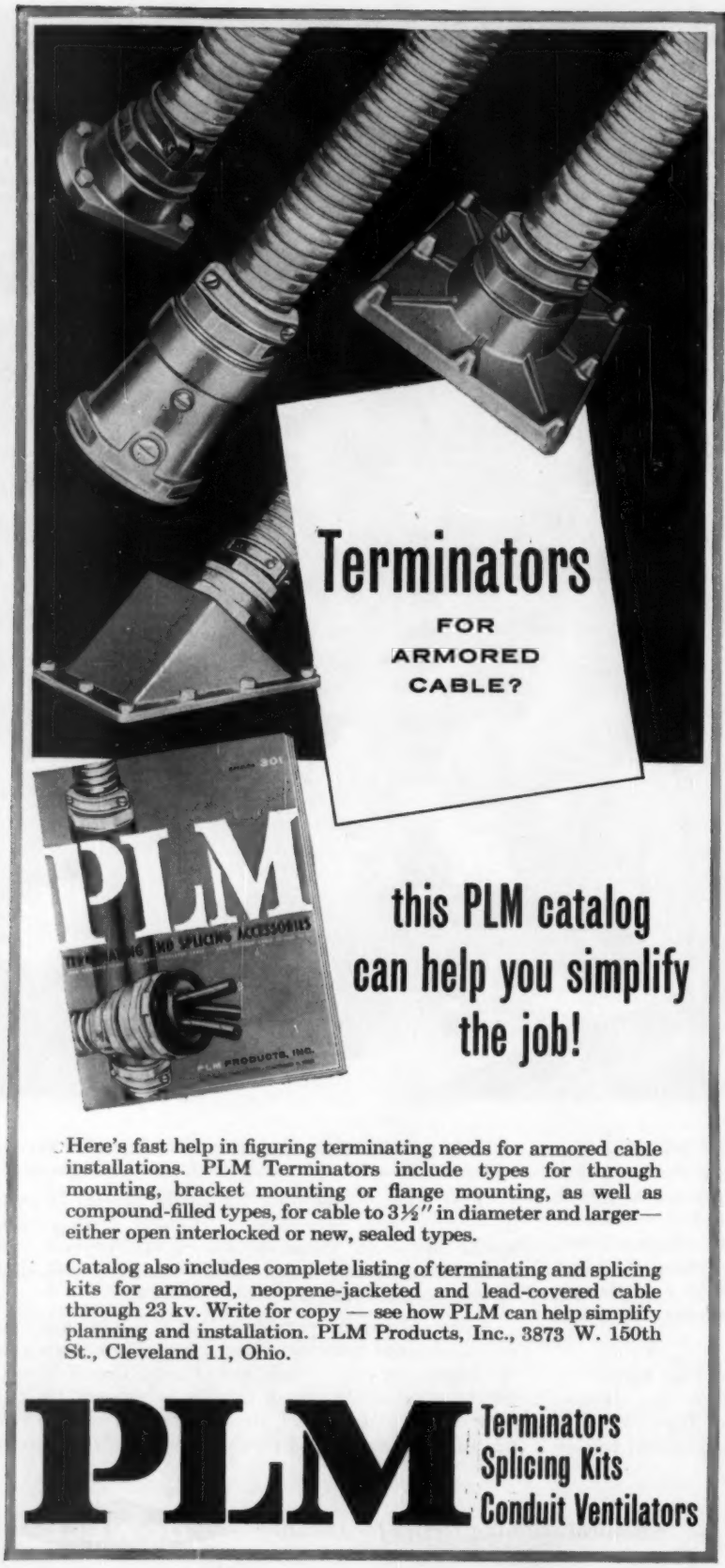
THIS MAN CAN ADD TO YOUR PROFIT PICTURE. This is a Dowell service engineer—on the job. His knowledge and abilities in chemical cleaning can help you to greater profits. Recently, an eastern corporation used Dowell Service for its boiler cleaning maintenance. Dowell's service engineer studied the problem, did the job. His use of chemical solvents in cleaning tubes and other metal surfaces was effective. On the basis of Dowell Service, this company will realize improved profits of $440,000.

There are three ways you can clean your plant equipment: *Mechanically* with your own crews—inefficient, time consuming and expensive in today's industrial pace. *Chemically* with your own crews—again inefficient and unprofitable because of heavy payroll and the personnel's lack of qualification. Or with *Dowell Service,* the modern chemical cleaning method.

With Dowell Service you receive the benefits of more than fifteen years experience in chemical cleaning—plus special equipment, chemicals, research and trained personnel. You pay one charge, get an efficient job, handled by knowledgeable people.

Every industry can profit from Dowell Service. Ask your maintenance and operating engineers if they have thoroughly investigated the profit possibilities of using Dowell Service. DOWELL INCORPORATED—A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY. Headquarters and research center, Tulsa, Oklahoma; 165 offices and stations to serve you.

Chemical cleaning service for industry DOWELL



Here's fast help in figuring terminating needs for armored cable installations. PLM Terminators include types for through mounting, bracket mounting or flange mounting, as well as compound-filled types, for cable to 3½" in diameter and larger—either open interlocked or new, sealed types.

Catalog also includes complete listing of terminating and splicing kits for armored, neoprene-jacketed and lead-covered cable through 23 kv. Write for copy — see how PLM can help simplify planning and installation. PLM Products, Inc., 3873 W. 150th St., Cleveland 11, Ohio.

PLM Terminators
Splicing Kits
Conduit Ventilators

Capacitor Kvar Increased to 45 Million During 1957

The number of installed capacitor kilovars in the United States increased from 40.5 million to 45 million during 1957, according to W. G. Hart, manager of power capacitor sales for General Electric's Capacitor Department.

The ratio of installed capacitor kilovars to peak-load kilowatts was 38% at the end of 1937. Hart predicted that it would reach 50% by 1967.

Though there was a slow-down in the rate of installing capacitors in the second half of 1957, the general trend of utilities to push system power factors toward unity continues at an accelerated rate, Hart said. He pointed out that "the low cost of capacitors compared to other system investments provides utilities with a compelling reason for going to system power factors approaching unity at the time of peak load. No product purchased by utilities offers comparable cost reducing opportunities," Hart declared.

NEMA Plans Issuing Wire & Cable Handbooks

National Electrical Manufacturers Association, New York, will issue wire and cable technical handbooks according to proposed plans of the Wire and Cable Section.

The handbooks would contain data based on industry standards covering individual wire and cable products. This information would replace similar technical data now included in manufacturers' catalogs. Chairman of the Section is B. F. Ilsley, general manager of General Electric Co's Wire & Cable Dept, Bridgeport, Conn.

Sylvania Reports These Developments

Sylvania Electric Products Inc announced these developments:

• Introduced a 3⅜-in. 150-w lamp for 8-mm home movie projectors. Other potential uses are automatic controls, infrared heating, and microscopy illumination. Known as the Tru-Flector lamp, it has an in-

side fixed reflector, has a list price of $5, will be used in new projector models, is smaller and has a luminosity about the same as present 500-w lamps.

• Awarded a Civil Aeronautics Administration contract for 31 systems of airport approach lights. The lighting, known as Electronic Flash Approach System, consists of a row of flashing "strobeacon lights" (EW, Jan. 23, 1956; p 264).

Plant Expansions

• In the South and Southwest, users in the power and communication fields will have Hubbard Co's pole line hardware and lighting equipment more readily available. The company opened a 30,000-sq ft warehouse and office on a 14-acre site at Plano (north of Dallas), Texas.

• A ninth potline was put in operation last month at the Chalmette, La., reduction plant of Kaiser Aluminum & Chemical Corp. This $15 million addition having 144 electrolytic cells will increase Chalmette's primary aluminum capacity by 27,500 tons annually to 247, 500 tons total.

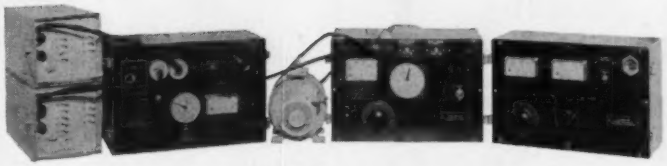
• Aimed for the north central U. S., initial metal components for electrical transmission towers and electrical switchyard units have started rolling off the new production lines of Anchor Metals, Inc, new Fort Madison, Iowa, plant. Full production in excess of 500 tons a month is slated for 1958.

• With the purchase of a 15-acre plant site in Sunnyvale, Calif., Day-Brite Lighting Inc of California moves one step closer to manufacturing its line of commercial and industrial fluorescent lighting fixtures. Serving the western states, Alaska, Hawaii, and foreign markets, the Day-Brite Lighting, Inc subsidiary has been doing only the assembling of parts manufactured by its parent company. The plant will cost at least $1 million and will be under construction by the end of 1958. A hint of mergers in the

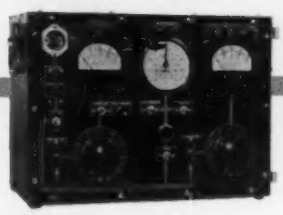
(*Continued on page* 98)

A NELSON FIRST

Portable Relay Test Units for proper testing and maintenance of switchgear components



Type RA1-1 Nelson portable test units which may be used in combination for complete testing of switchgear components.



Type RD1-1 Nelson portable test unit for simple testing of meters, protective relays, overload heaters, tripping coils, etc. For use with AC circuits only.

Use Nelson Relay Test Units to

Improve Operating Performance

Eliminate Excessive "Down-Time" when testing switchgear.

Up to now a complete rewiring job was necessary to test each different device in a piece of switchgear. Nelson's field service department, working with Nelson's engineering and research departments, has produced a portable relay test unit that will test relays, meters, coils, circuit breakers, etc.

Base your maintenance and inspection procedures around Nelson test units and be assured of economy in operation, less time spent in testing and generally improved performance of your equipment, resulting in less "down-time" and elimination of much lost production.

Write for Bulletin 774

A major source of Electrical Control Equipment for Industry

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

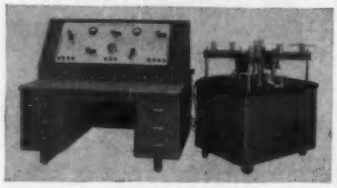
DO YOU HAVE TROUBLE

getting sufficient current when testing

CURRENT TRANSFORMERS

• **THE STATES DESIGN** helps get more current at the *test point* . . . 10% and 2% ratio selector switches coupled with a small induction regulator provides a quick method for obtaining whatever current desired.

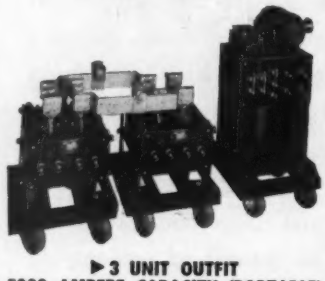
Offers smooth and quick adjustment of current to full capacity of the Form C.T.T. outfits which are made in 1000, 2500, 5000, 6000 and 10,000 ampere capacities.



▶ **5000 AMPERE CAPACITY**

Control Table on left, Loading Transformer and Quick Contactor on right.

Contactor provides quick connection for standard transformer and transformer under test.



▶ **3 UNIT OUTFIT**
5000 AMPERE CAPACITY (PORTABLE)

2 Loading Transformers, 2500 amperes each and 1 control unit. Transformers may be used together or separately. A versatile outfit!

THE STATES COMPANY

THE STATES COMPANY
3 New Park Ave., Hartford, Conn.

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☐ Transformer Test Equipment
☐ Watthour Meter Test Tables

Name .....Title.....

Firm .....

Address .....

City .....Zone....State.....

Plant Expansions

(*Continued from page* 97)

offing: Day-Brite can't say how big the plant will be because it's considering "expansion other than normal growth." The firm holds an option on 15 acres adjoining the site.

• To supply the southern market Stephens-Adamson Mfg Co started full production of conveyor system parts at Clarksdale, Miss., on Dec. 1, 1957. The 40,000-sq ft manufacturing area is in a building constructed of tilt-up style concrete walls, located on a 15.75-acre tract. D. R. Dolan is manager of the Clarksdale Division.

M & M Briefs

Riley Stoker Corp, Worcester, Mass., reports that 23 Turbo Furnace boilers have been ordered to date. Three coal-fired units will be installed in industrial plants.

W. R. Grace & Co, New York, has formed International Metalloids, Inc, a Puerto Rican subsidiary of Grace Internacional S. A., for the production of high-purity elemental silicon.

Federal Lighting Corp, Cleveland, Ohio, has been formed as a manufacturing division of Frankelite Co, to produce Diamond F brand industrial and residential lighting fixtures.

Alcoa—Aluminum Co of America is optioning land in the vicinity of Merwin, Pa., 22 miles east of Pittsburgh, as the future site of a major campus-type research and development center.

Armstrong Contracting and Supply Corp is a wholly owned subsidiary formed by Armstrong Cork Co to carry on the operations of the company's Insulation Division effective Jan 1, 1958. Applications include steam generating and industrial processing. J. W. Liddell is president of the corporation with headquarters at Lancaster, Pa.

Electrical Construction COST MANUAL

Just Published! Helps you save time and trouble in estimating electrical construction costs and developing more realistic, profitable bids. Develops standard assemblies as a nucleus for unit costing of materials and labor; covers job factors, overhead, and profit; shows how to bring these factors together in an integrated costs system and estimate. **By Ralph E. Johnson, Pres., Sturgeon Elect. Co., 427 pp., 226 illus., $10.00**

WIRING MANUAL FOR HOME AND FARM

Just Published! A practical manual to help you plan wiring systems that will effectively meet today's growing electrical needs in home and farm. Methods for determining loads, service entrance feeder size, number and size of branch circuits, number and type of outlets—these and other practical helps are all part of this handy guide. **By A. Carl Bredahl, Dir. of Tech. Services, Westinghouse Electric Corp., 221 pp., 97 illus., $4.95**

ENGINEERING MATERIALS HANDBOOK

Just Published! Gives answers by a number of specialists to both routine and specialized questions regarding the choice of engineering materials. Considers materials from the viewpoint of engineering structures, machinery, and equipment, and includes technical tables, design information, structural characteristics, etc. Emphasis is placed on the fabricated forms of materials, physical and mechanical properties, advantages, limitations, etc. **Edited by Charles L. Mantell, Consult. Engr.; Newark College of Engrg., 1906 pp., 648 illus., $21.50**

EPOXY RESINS

Just Published! Covers the whole range of information needed to make effective use of epoxy resins. Applications, covered against a background of chemistry and technology of the resins, and their reactions in curing, include encapsulation of electric motors, cable sealants, and glues for patching transformer bushings, and other hard to maintain items. **By Henry Lee and Kris Neville, The Epoxylite Corp., 305 pp., 176 illus., $8.00**

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Cresap Interview

(*Continued from page* 47)

make a reasonable profit is the keystone to the electric industry's ability to continue its long range research and development program.

You have observed that the price realization index for electrical equipment has, since 1952, lagged 9% behind that of the steel industry. Does this imply the magnitude of price increases the utilities must anticipate?

Not necessarily. The objective was to point out the need to stabilize prices at a level high enough to compensate for increase in costs.

You reported appliance prices 2% below the 1952 level, contrasting with a 13% increase for automobiles. How can this disparity be corrected without further depressing electric appliance sales?

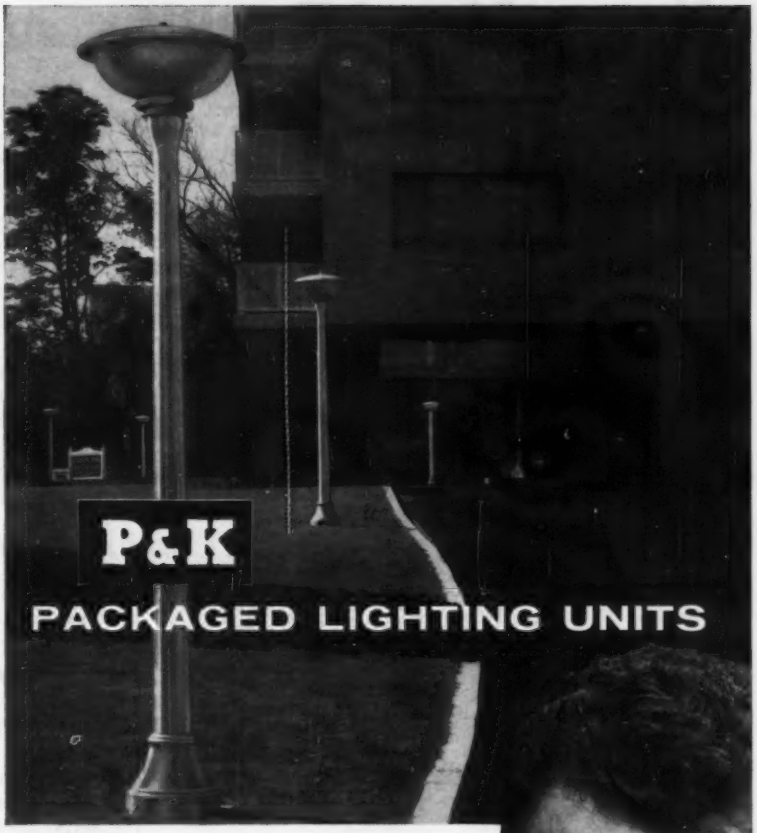
If prices could be kept abreast of labor and material costs, which show up as increases in consumer income, such price increases should not hurt the market. The depressed condition has come about from "bargain pricing" by all participants in the appliance industry.

Last April you said Westinghouse would spend $75 million in 1957 for new plants and plant improvements. Did you maintain this schedule and how will 1958 compare?

We about met it in '57. The coming year will take us to $90 or $100 million. The economic picture today does not justify pulling back in this expansion program. Most of this plant expansion planned is for our utility products—turbine generators, switchgear, transformers—to match the growth curve of the electric utility industry.

Did Westinghouse sales in 1957 measure up to your $2-billion expectations? And does your forecast, particularly for the apparatus business, reflect continued utility expansion at 7 to 8% per year?

We made the $2 billion goal. Our forecast for 1958 shows utility orders slightly over the 1957 level, but the exact amount depends upon the volume of business in "shelf" items.



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the P & K package unit consisting of a CIRCLElux incandescent post top unit, and a slim, tapered ten-foot aluminum pedestal to achieve both the lighting they wanted and the beauty their handsome building required. For more information, write for catalog L-2.

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News About People

Branan is Elected VP of OG&E

Herbert L. Branan recently has been elected a vice-president of the Oklahoma Gas & Electric Co.

Branan began his association with OG&E as a special attorney in 1944. Lately he has devoted much of his time to the company's municipal relations and franchises. In 1955 he was elected assistant to the president.

A graduate of the University of Oklahoma Law School, Branan has been active in government affairs. He served three terms in the state house of representatives as chairman of the revenue and taxation committees, and as representative of his state at various congressional hearings in Washington. He was also assistant to Oklahoma's Gov Leon C. Phillips.

H. L. BRANAN

Linde Gets New Nuclear Post

Leonard J. Linde has been named project manager of Stellarator Associates, a combined staff organization of Allis-Chalmers Manufacturing Co and Radio Corp of America.

The new group will design and build a facility at Princeton University for advanced research into controlled thermonuclear reaction.

Ebasco Advances Pierce

Robert E. Pierce has has been appointed chief consulting engineer of Ebasco Services, Inc. He succeeds Howard L. Melvin who remains general engineering consultant.

Pierce joined Ebasco 31 years ago. In 1948, he became consulting engineer in charge of the electrical engineering staff. S. B. Smith succeeds Pierce.

PERSONAL BRIEFS

New stockholders of Middle West Service Co are VP's **Malcolm R. Rodger** and **Robb M. Winsborough,** and **Leroy A. Swanson,** manager of accounting, systems, and procedures.

General Electric Co has promoted **Boris M. Wundt** to the new post of turbine structural engineer, large steam turbine-generator dept . . . The reorganized transistor and rectifier component has named **Theodore E. Jamro** as manager of the Buffalo transistor plant and acting manager of the Clyde (N.Y.) semiconductor rectifier plant and appointed **George F. Platts** manager of the Syracuse semiconductor plant. The post of manager of manufacturing has been abolished . . . **Charles M. Heiden** is new manager of research application dept, GE Research Laboratory.

Bituminous Coal Research, Inc, has promoted **Dr Harold J. Rose** to vice president and consultant, **J. R. Garvey** to director of research, and **J. W. Igoe** administration director.

The General Products Division of Allis-Chalmers Manufacturing Co has appointed **E. R. Danielson** as assistant to **W. M. Wallace,** vice president-general manager. In other A-C promotions, **H. A. Bartling** was made assistant to the general manager, Nuclear Power Division; **C. B. Smith,** director of service, Industries Group; **C. R. Gibbs,** service section manager; **T. J. Hanley,** assistant manager, service section; and **L. B. Burgeson,** assistant to the director of service.

RLM Standards Institute, Inc, has as its new president **William P. Lowell, Jr,** manager of commercial engineering and quality control for Lighting Division, Sylvania Electric Products, Inc.

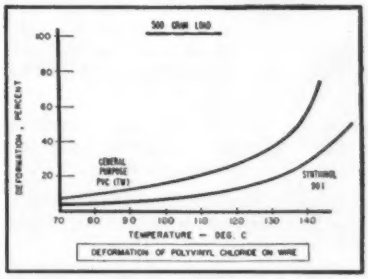
ADVERTISEMENT

An unusual polyvinyl chloride compound

CURRENT TRENDS

No. 10 in a series of articles

Polyvinyl chloride (PVC) compounds have been widely used in the wire and cable industry. These compounds have many useful properties and have found wide application as insulations and sheaths. These properties and applications were discussed in Current Trends No. 4, entitled "Progress Report on Polyvinyl Chloride Insulations." Like most materials, the conventional PVC compounds have limitations, and there are many applications where these weaknesses have prevented taking full advantage of the good features. This discussion is about a special PVC compound, which was designed and developed in an effort to incorporate into a single compound as many desirable properties as possible. Known as Synthinol 901, this compound was developed in the laboratories of the Rome Cable Corporation, Rome, New York. Today Synthinol 901 is being used as insulation and sheath for wires and cables in many applications where conditions of installation or use require properties not to be found in conventional PVC compounds.



Graph shows heat deformation vs. temperature, and compares Synthinol 901 with conventional Type TW compounds. Test run in accordance with Underwriters' Laboratories standard procedure, except for temperature.

Shortly after World War II, the Underwriters' Laboratories established the need for a PVC insulated wire suitable for wiring appliances where an operating temperature rating of 105 C was required. Rome Cable laboratory attacked the problem of developing a PVC compound to meet U/L requirements. The laboratory was also given a list of desired additional properties for incorporation into this compound. This project assignment was completed in 1949, at which time Rome Cable introduced Synthinol 901. Since 1949 this compound has provided the solution to a rather impressive list of tough wiring problems.

True, there are many 105 C PVC compounds available today; there are likewise compounds available which possess one or more of the individual properties on the list describing Synthinol 901. What is unusual is that here, for the first time, was a single PVC compound which possessed all of these superior properties and which also retained all of the properties found in conventional PVC materials.

Rather than presenting data and charts, it is believed that the practical value of this compound is better illustrated by relating a few of the concrete results of eight years of continuous work with users who have had difficult problems. These case histories are all a matter of record.

1. Oil refinery, industrial and chemical plant wiring.

Plant and oil refinery engineers had long used Type TW for plant wiring. Results were good, but too often the heat deformation characteristics of conventional TW caused trouble in warm locations. Since one of the outstanding properties of Synthinol 901 was its superior resistance to deformation, this material was tried, and soon became widely used because of its much better record in service. During several years of experience Synthinol 901 proved to have chemical and solvent resistance so superior to conventional materials that it came into wide use where this resistance was needed. In these industrial applications, which are not under the jurisdiction of the National Electrical Code, the higher temperature ratings have made possible appreciably higher current carrying capacities, with consequent savings.

In chemical plant wiring the corrosive action of chemicals and solvents has always been a tough problem. Although PVC has inherently better resistance to chemicals and solvents than many other materials, engineers desired further improvement. One user ran a series of long time tests with samples immersed in various solvents, acids, and alkalis. The results clearly showed that Synthinol 901 would give longer life than other PVC compounds, when exposed to these chemicals.

2. Oil-filled transformers.

Transformer engineers have long been searching for a cable construction to replace the varnished cambric-insulated cable used for high voltage and tap changer leads in oil-filled transformers. One transformer manufacturer, encouraged by successful experience with Synthinol 901 in other applications, began a comprehensive study of this insulation in lieu of VC on these high voltage leads. In operation these leads are immersed in the transformer oil at elevated temperatures. This test program extended over several years, and included evaluation of almost every conceivable effect of Synthinol 901 on the life and performance of the transformer. These engineers came up with the following reasons for standardizing on Synthinol 901 for this application:

1. There was less sludge in the oil than when VC insulation was used.
2. There was no harmful degradation of electrical properties of the oil.
3. Conductors ran cooler when insulated with Synthinol 901, permitting a 7% increase in current rating of the lead cables.
4. The use of Synthinol 901 in lieu of VC afforded substantial dollar savings.

3. Coil Leads.

Many manufacturers of small coils for use in electrical and electronic components had tried for years to use PVC insulated lead wires in their manufacturing operations. These coils, with leads attached, are put through a varnish or wax impregnation followed by a baking cycle. The baking cycles may be as long as 16 hours at temperatures as high as 105 C. In a great many of these cases PVC insulated lead wires had given trouble due to shrinkage, cracking, and stiffening during the impregnation and subsequent baking. Here is an application where Synthinol 901 has been doing an almost faultless job. After nearly eight years of wide usage, there has been no case of shrinkage, cracking, or stiffening of insulation reported where Synthinol 901 has been used in this application.

4. Panelboard wiring.

For many years panelboards and switchboards have been wired with Type TA wire. This wire has a layer of asbestos over a primary insulation of PVC. The asbestos has been used as a protection against the heat deformation which was known to occur at sharp bends and points where wiring was held under clamps. Transformer and machine tool manufacturers have found that the superior resistance of Synthinol 901 makes the asbestos covering unnecessary. In this application, for additional safety, the insulation thickness is normally 1/64" heavier than standard. These manufacturers have found Synthinol 901 to be an economical solution to their particular needs.

These case histories are only a few of the applications where this unusual compound has served well. Synthinol 901 has been proven by test and actual use to be superior to conventional PVC compounds in the following ways:

1. Suitable for continuous operation at higher temperatures.
2. More stable under severe heat cycling.
3. Suitable for continuous immersion in hot transformer oil.
4. Superior resistance to chemicals and solvents.
5. Greater resistance to heat deformation.

All of our experience and knowledge in this field is available to you. If you have a wire and cable problem where you think Synthinol 901 might prove useful, why not let us help you?

ROME CABLE CORPORATION, Rome, New York

The Meetings Calendar

JANUARY

New England Farm Electrification Institute—University of Massachusetts, Amherst, Mass., Jan. 22-24.

Public Utilities Advertising Association—Regional Meeting, San Francisco, Calif., Jan. 23-24.

Industrial Heating Equipment Association — Penn-Sheraton Hotel, Pittsburgh, Pa., Jan. 27-28.

American Society of Heating and Air-Conditioning Engineers—64th Annual Meeting, Penn-Sheraton Hotel, Pittsburgh, Pa., Jan. 27-29.

Home Improvement Products Show—Hotel Sherman, Chicago, Ill., Jan. 27-29.

Canadian Electrical Association — Eastern Zone Meetings, Niagara Falls, Ontario, Jan. 27-30.

Annual Doble Engineering Clients Conference—Sheraton-Plaza Hotel, Boston, Mass., Jan. 27-31.

Edison Electric Institute—Dealer Coordination Committee, EEI Headquarters, New York City, Jan. 30-31.

Pennsylvania Electric Association—Engineering Section, Prime Movers and Structures & Hydraulic Committees joint meeting, Pocono Manor Inn, Pocono Manor, Pa., Jan. 30-31.

FEBRUARY

National Association of Purchasing Agents—Public Utility Buyers Group Mid-Winter Meetings, Sheraton Hotel, Philadelphia, Pa., Feb. 2-4.

National Rural Electric Cooperative Association—Annual Meeting, Memorial Auditorium, Dallas, Tex., Feb. 2-6.

• **Edison Electric Institute**—Prime Movers Committee, Penn-Sheraton Hotel, Pittsburgh, Pa., Feb. 3-5; Industrial Power & Heating Group, Netherland Hilton Hotel, Cincinnati, Ohio, Feb. 6-7; EEI-AGA 1958 Conference Final Planning Meetings, Ben Franklin Hotel, Philadelphia, Pa., Feb. 6-7; Electrical Equipment Committee, Dayton Biltmore Hotel, Dayton, Ohio, Feb. 10-11; Commercial Lighting Committee, New Orleans, La., Feb. 10-11; Transmission & Distribution Committee, Lord Baltimore Hotel, Baltimore, Md., Feb. 11-12; Residential Promotion Committee, New York City, Feb. 13-14; Electric Space Heating & Air Conditioning Committee, Birmingham, Ala., Feb. 13-14; Commercial Cooking & Water Heating Committee, Washington, D. C., Feb. 17-18; Meter & Service Committee, Sheraton Hotel, Philadelphia, Pa., Feb. 17-19.

Industrial Electrification Council — National Industrial Heating Conference, Netherland Hilton Hotel, Cincinnati, Ohio, Feb. 3-6.

American Institute of Electrical Engineers—Winter General Meeting, Statler and Sheraton-McAlpin Hotels, New York City, Feb. 3-7.

Missouri Valley Electric Association—Industrial & Commercial Sales Conference, President Hotel, Kansas City, Missouri, February 6-7.

• **Pennsylvania Electric Association**—System Operation Committee, Hotel Roosevelt, Pittsburgh, Pa., Feb. 6-7; Relay Committee Winter Meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., Feb. 13-14; System Planning and Transmission & Distribution Committees joint meeting, Penn-Sheraton Hotel, Pittsburgh, Pa., Feb. 20-21; Electrical Equipment Committee Winter Meeting, Hotel Roosevelt, Pittsburgh, Pa., Feb. 27-28.

NATIONAL ELECTRICAL WEEK WILL BE OBSERVED FEBRUARY 9-15.

American Public Power Association—Engineering & Workshop Meetings, Chattanooga, Tenn., Feb. 13-14.

National Society of Professional Engineers—Spring Meeting, Michigan State University, East Lansing, Mich., Feb. 13-15.

American Institute of Mining, Metallurgical, and Petroleum Engineers—Annual Meeting, Hotel Statler, New York City, Feb. 16-20.

National Wiring Sales Conference — Statler Hotel, Detroit, Michigan, Feb. 20-21.

MARCH

Southern Safety Conference, Inc—Exposition, Peabody Hotel, Memphis, Tenn., March 2-4.

• **Right of Way Meeting**—Electrical World's second conference on R/W practices, procedures, and problems, Conrad Hilton Hotel, Chicago, Ill., March 6-7.

Pacific Coast Electrical Association — Business Development Section, Statler Hotel, Los Angeles, Calif., March 6-7; Engineering & Operations Section, Sheraton Palace, San Francisco, Calif., March 27-28.

Nuclear Congress—Co-sponsored by American Society of Mechanical Engineers and the Engineers Joint Council, International Amphitheater, Chicago, Ill., March 16-22.

National Association of Corrosion Engineers—Annual Conference & Exhibition, Municipal Auditorium, San Francisco, Calif., March 17-21.

American Society of Mechanical Engineers—Management Conference Committee, Hotel Somerset, Boston, Mass., March 19-20.

Edison Electric Institute — Industrial Relations Committee, Headquarters, New York City, March 20; Annual Sales Conference, Edgewater Beach Hotel, Chicago, Ill., March 24-27.

Institute of Radio Engineers—National Convention, Waldorf-Astoria Hotel and New York Coliseum, New York City, March 24-27.

• **Northwest Public Power Association**—Engineering and Operations Section, Clark County PUD Electric Center, Vancouver, Wash., March 26-27.

American Power Conference—20th Anniversary Meeting, Sherman Hotel, Chicago, Ill., March 26-28.

• **Electrical Maintenance Engineers Association of Southern California**—Industrial Electric Show and Conference, Shrine Convention Hall, Los Angeles, Calif., March 27-29.

Southeastern Electric Exchange—Annual Meeting, Boca Raton Hotel and Club, Boca Raton, Fla., March 31-April 2.

• Additions this week.

MORE BIG DATES FOR '58

American Public Power Association—Annual Meeting, New Orleans, May 6-8.

National Association of Purchasing Agents — Annual Convention, Chicago, May 11-14.

Edison Electric Institute—26th Annual Convention, Boston, June 9-12.

American Institute of Electrical Engineers—Summer General Meeting, Buffalo, June 22-27.

National Electrical Manufacturers Association—Annual Meeting, Atlantic City, Nov. 10-14.

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ROME CABLE

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Books

How To Wire

Practical Electrical Wiring: Residential, Farm, and Industrial. By H. P. Richter. Published by McGraw-Hill Book Co, Inc, 330 W 42nd St, New York 36, N. Y. 602 pages, illustrated. Price $6.75

The fifth edition of this practical wiring manual revises the 1952 edition to conform to the 1956 National Electrical Code. A basic description of recommended wiring techniques for home, farm, and small industry, it contains frequent explanations and illustrations of code requirements. Its practical, "how-to-do-it" treatment, unencumbered by theory and devoid of mathematics beyond simple arithmetic, should be intelligible to the interested layman.

Electronic Applications

Radio Electronics. By Samuel Seely. Published by McGraw-Hill Book Co, Inc, 330 W 42nd St, New York 36, N. Y. 487 pages, illustrated. Price $7.00

Electronic Engineering. By Samuel Seely. Published by McGraw-Hill Book Co, Inc, 330 W 42nd St, New York 36, N. Y. 525 pages, illustrated. Price $8.00

These books are complementary but independent revisions of the author's earlier work, *Electron Tube Circuits.* Although some of the more fundamental material is duplicated in the two books, they have distinctly different emphasis. *Radio Electronics* is concerned primarily with communication circuits and includes extensive discussions of commonly used communications equipment.

Electronic Engineering is devoted principally to non-radio circuits. Notable inclusions are treatments of summing, integrating, and other computer circuits; a discussion of transistors and solid state theory; and a section on network analysis.

Both books present thorough theoretical treatments of all subject matter, and include both physical and mathematical analyses. A knowledge of calculus is essential for a complete understanding of the material in these two text books.

Books Received Since Sept 16, 1957

Elements of Heat Transfer, Third Edition. By Max Jakob and George A. Hawkins. Published by John Wiley & Sons, Inc, 440 Fourth Ave, New York 16, N. Y. 308 pages, illustrated. Price $6.75.

Selection and Application of Metallic Rectifiers. By S. P. Jackson. Published by McGraw-Hill Book Co, Inc, 330 W 42nd St, New York 36, N. Y. 320 pages, illustrated. Price $8.00.

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(Classified Advertising)

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100	Al. Chal. T.E.F.C.B.B.	ARZ-505	1800

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Readers Forum

Shippingport Story "Extremely Disconcerting" to IBEW

To the Editor:

In the October 7 ELECTRICAL WORLD the following statement appears: "delay in non-nuclear equipment delivery and labor trouble will probably prevent plant's complete startup in 1957."

This reference to "labor trouble" was extremely disconcerting to officers of the International Brotherhood of Electrical Workers, since we have been cooperating with Duquesne Light Co on both the national and local level ever since the Shippingport plant was begun. Therefore, we checked with both the general contractor and the Duquesne Light Co.

We believe the attached letters speak for themselves.

In light of this correspondence we request that you retract your statement of October 7 as soon as possible. The IBEW has a good reputation for industry and integrity and such implications are harmful to us and are therefore resented.

Gordon M. Freeman
International President
IBEW
Washington 5, D. C.

To: Andrew R. Johnson
International Representative, IBEW

You recently referred to a news item in the October 7 issue of ELECTRICAL WORLD regarding Shippingport which stated that "delay in non-nuclear equipment delivery and labor trouble will probably prevent the plant's complete startup in 1957."

We did not furnish this information nor do we have any knowledge as to the source of it. Further, the information is inconsistent with our knowledge of the situation.

Regarding the efforts of IBEW on the Shippingport project, on Dec. 20, 1956, Mr Gray of our organization wrote to IBEW business agents regarding the excellent cooperation we had been receiving from IBEW at Shippingport.

This excellent cooperation has continued during the past year.

S. G. Page
Director of Personnel
Duquesne Light Co
Pittsburgh, Pa.

To: Andrew R. Johnson
International Representative, IBEW

Confirming our conversation with you relative to work at the atomic power plant at Shippingport, the cooperation given us by your union, as well as all other trades, with respect to the matter of assignment of work was very fine. The reason for the smooth operation on the job, we believe, can be attributed to meetings held with local business agents and international representatives where controversial areas of work were reviewed and assignment of work made prior to start of construction.

In fact, that practice prevailed throughout the entire job as additional potentially controversial items become known.

There were approximately 950 men from all trades on the job at the peak of employment with major part of the work extending from January 1956 to the present time. In all this time there were only really two work stoppages, one of five days and the other of three days, neither of which involved electricians.

These two stoppages we do not feel, however, delayed completion of the work and in the final analysis the problems were worked out on a satisfactory basis.

Thank you again for your cooperation.

John K. Beidler
Vice President and General Manager
Dravo Corp
Pittsburgh, Pa.

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